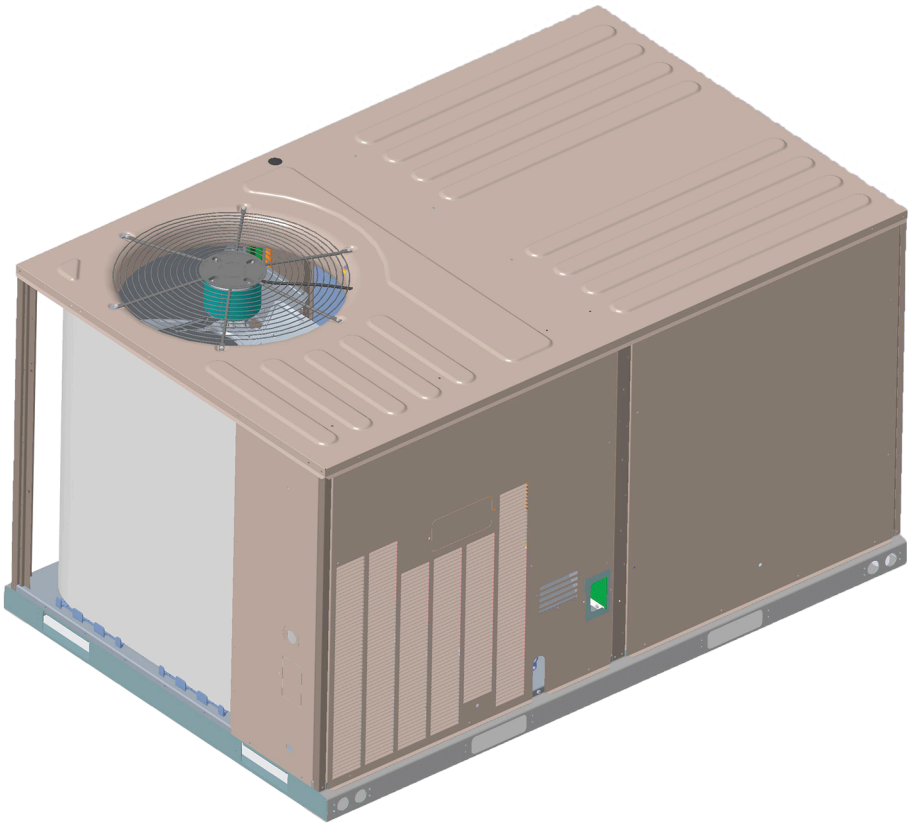
Installation Manual KL Series 3 ton to 5 ton

R-454B, 60 Hertz



BHC Residential & Light Commercial LLC, 5005 York Drive, Norman, OK 73069

6314103-UIM-D-0526

Supersedes: 6314103-UIM-C-0525

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Contents

General

KL units are single package air conditioners with optional gas heating designed for outdoor installation on a rooftop or slab and for non-residential use.

These units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require electric power, gas supply (where applicable), and duct connections.

Certifications

Tested in accordance with:

GoTemp Pro App

BHC Residential & Light Commercial LLC believes in empowering our customers with up-to-date, unit-specific information. Download the GoTemp Pro app, a powerful-comprehensive app designed for contractors on the jobsite, available now in the App Store for iOS and Google Play for Android. Use the App to scan the unique QR code on the unit rating plate for easy access to product information and resources such as nomenclature, technical guide, installation manual, wiring diagrams, parts list, product registration, warranty and much more. Simplify your tasks, save time, and stay ahead with the most comprehensive app built for professionals.

GoTemp Pro integrates functionality previously provided by CWa and MAP, allowing you to utilize the on-board communication card or simply plug in the CWCVT to enable Bluetooth connectivity.

Safety considerations

⚠ This is a safety alert symbol. When you see this symbol on labels or in manuals, be alert to the potential for personal injury.

Understand and pay particular attention the signal words **DANGER**, **WARNING**, or **CAUTION**.

DANGER indicates an **imminently** hazardous situation, which, if not avoided, **will result in death or serious injury.**

WARNING indicates a **potentially** hazardous situation, which, if not avoided, **could result in death or serious injury.**

CAUTION indicates a potentially hazardous situation, which, if not avoided **may result in minor or moderate injury.** It is also used to alert against unsafe practices and hazards involving only property damage.

⚠ WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance or for additional information, consult a qualified contractor, installer, or service agency.

⚠ CAUTION

This product must be installed in strict compliance with the installation instructions and any applicable local, state and national codes including, but not limited to building, electrical, and mechanical codes.

⚠ WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual.

For assistance or additional information consult a qualified installer, service agency, or the gas supplier.

WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS:

• Do not try to light any appliance.

• Do not touch any electrical switch; do not use any phone in your building.

• Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

• If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

WARNING

ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death or property damage. Improper servicing could result in dangerous operation, serious injury, death or property damage.

• Before servicing, disconnect all electrical power to furnace.

• When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.

• Verify proper operation after servicing.

Due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel should install, repair, or service this equipment. Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters.

Observe all precautions in the literature, labels, and tags accompanying the equipment whenever working on air conditioning equipment. The installation must conform with local building codes or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the National Gas and Propane Installation Code, CSA B149.1.

Wear safety glasses and work gloves. Use quenching cloth and have a fire extinguisher available during brazing operations.

Inspection

As soon as a unit is received, it must be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing.

CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state and national codes including, but not limited to, building, electrical, and mechanical codes.

The furnace and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing at pressures in excess of 1/2 psig.

Pressures greater than 1/2 psig will cause gas valve damage resulting in a hazardous condition. If it is subjected to a pressure greater than 1/2 psig, the gas valve must be replaced.

The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig

Reference

Additional information is available in the following reference forms:

- Technical guide - KX/KQ/KY/KL 04-14
- General installation - KL04-06
- Economizer accessory :
  - Vertical flow dry bulb economizer field installed
  - Horizontal flow dry bulb economizer field installed
- Power exhaust:
  - Vertical flow dry bulb economizer field installed
  - Horizontal flow dry bulb economizer field installed

Renewal parts

Contact your local ducted systems parts distribution center for authorized replacement parts.

Approvals

Design certified by CSA as follows:

- For use as a cooling only unit, cooling unit with a forced air furnace.
- For outdoor installation only.

- For installation on combustible material and may be installed directly on combustible flooring or, in the U.S., on wood flooring or Class A, Class B or Class C roof covering materials.
- For use with natural gas.

CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

Nomenclature

3-5 Ton Model Number Nomenclature

KL	G	04	D	2	A	1	A	A	1	A	1	1	1	A	1

Product Category

KL = Pkg AC High Efficiency 3-stage, R-454B

Heat Type (3)

E = No Heat, Electric Heat Field Installed
G = Gas Heat

Nominal Cooling Capacity

04 = 3 Ton
05 = 4 Ton
06 = 5 Ton

Heat Size

A = No Heat (Cooling Only)

Gas Heat

D = Low Heat
E = Medium Heat
F = High Heat
L = Low Heat (Low NOx)
M = Medium Heat (Low NOx)
N = High Heat (Low NOx)
R = Low Heat (Stainless Steel)
S = Medium Heat (Stainless Steel)
T = High Heat (Stainless Steel)
U = Low Heat (Ultra-Low NOx)
W = High Heat (Ultra-Low NOx)

Voltage

1 = 208/230-1-60 (3 ton only)
2 = 208/230-3-60
4 = 460-3-60
5 = 575-3-60

Airflow

A = Standard Static
B = Medium Static
C = High Static

Options

1 = None
3 = VFD IntellisSpeed

Note: Not all options may be available. Contact local distributor.

Coil Options

A = Standard Indoor & Outdoor Coils
B = Standard Indoor Coil & ElectroFin Outdoor Coil
C = E-Coat Indoor Coil & Standard Outdoor Coil
D = E-Coat Indoor & Outdoor Coils
E = Standard Indoor & Outdoor Coils w/Reheat*
F = Standard Indoor Coil & E-Coat Outdoor Coil w/Reheat*
G = E-Coat Indoor Coil & Standard Outdoor Coil w/Reheat*
H = E-Coat Indoor & Outdoor Coils w/Reheat*

*KL04-06 reheat units in power supply of 208/230/460/575-3-60 options only.

Controls

A = Smart Equipment
B = Smart Equipment + BACnet MSTP, Mdbs, N2 COM Card
U = SkyQ Single Zone w/ Bluetooth
V = SkyQ Changeover Bypass w/ Bluetooth
W = SkyQ VAV w/ Bluetooth

Sensor Options

1 = None (Units come standard with factory installed supply air, return air, and outdoor air temperature sensors)
2 = RA[1] Smoke Detector
3 = SA Smoke Detector
4 = RA[1] & SA Smoke Detector
5 = Refrigerant Detection System (RDS)
6 = RA[1] Smoke Detector and RDS
7 = SA Smoke Detector and RDS
8 = RA[1] and SA Smoke Detectors and RDS

1. Return air smoke detector sensor must be relocated in the field Refer to the unit's installation manual

Economizer / Damper

A = None
G = Dry Bulb Economizer[1]- enhanced static
H = Enthalpy Economizer[1]- enhanced static

1. Smart Equipment models only

Convenience Outlet

1 = None
2 = Non-powered
3 = Powered

Electrical Options

1 = None
2 = Non-fused Disconnect[1]

1. Verify on the unit nameplate that the disconnect is properly sized for the application. Units with field installed electric heat may exceed the factory installed disconnect amperage rating.

Cabinet Options

1 = None
2 = Louvered Panels Installed (LP)
3 = Hinged Cabinet Doors (HAP)
4 = Hinged Cabinet Doors & Louvered Panels
5 = Condensate Overflow Switch (COF)
6 = COF, LP
7 = COF, HAP
8 = COF, LP, HAP

Special Options

(Used for National Accounts and other Special Editions

A = none
B = French Canadian Shipment (FCS)
C = VFD Shaft Grounding Device (SGD)
D = FCD, SGD

Product Generation

1 = First Generation

Installation

Installation safety information

This is an outdoor combination heating and cooling unit. Read the following instructions before installing the unit.

Note: The installer must provide the consumer with these instructions and direct them to retain the information for future reference.

- Refer to the unit rating plate for the approved type of gas for this product.
- Only install the unit in a location and position specified in Location.
- If you install the unit at an elevation greater than 2,000 ft, also install the appropriate high altitude accessory kit for this model.
- Always install the furnace to operate within its intended temperature-rise range, with the duct system, and within the allowable external static pressure range, as specified on the unit name or rating plate. See .
- Do not use this equipment for temporary heating of buildings or structures under construction.
- If the unit will be operated using propane gas, install the appropriate propane accessory kit for this model with the unit.
- Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks when checking all the connections, as specified in Installation safety information, Gas connection, and Post start checklist.

WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

Preceding installation

Read these instructions before you perform the installation. Complete the following steps:

1. Remove the two screws that hold the brackets in the forklift slots on the side of the unit.

Figure 1: Unit shipping bracket

Item	Description
A	Bracket screws
B	Bracket

2. Turn each bracket toward the ground. The protective cardboard covering drops to the ground.
3. Remove the protective covering from the condenser coil before operation.

Figure 2: Protective condenser covering

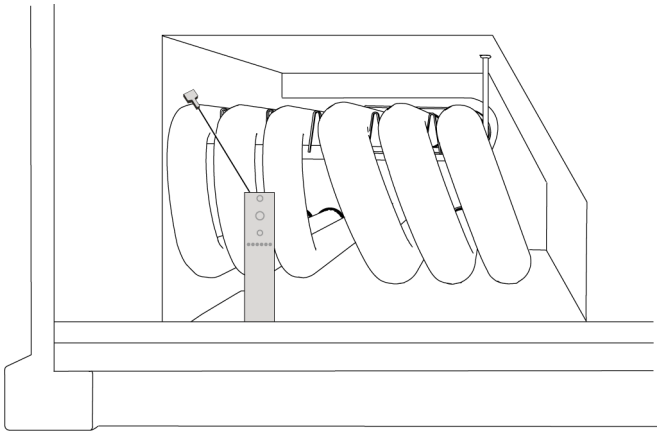
4. If a factory option convenience outlet is installed, you must install the weatherproof outlet cover in the field. The cover is located behind the filter access panel.
   a. Remove the shipping label that covers the convenience outlet.
   b. Follow the instructions on the back of the cover box.
   c. Attach the cover to the unit with the four screws provided.

CAUTION

208/230-3-60 and units with factory installed Powered Convenience Outlet Option are wired for 230 V power supply. Change tap on transformer for 208-3-60 operation. See unit wiring diagram.

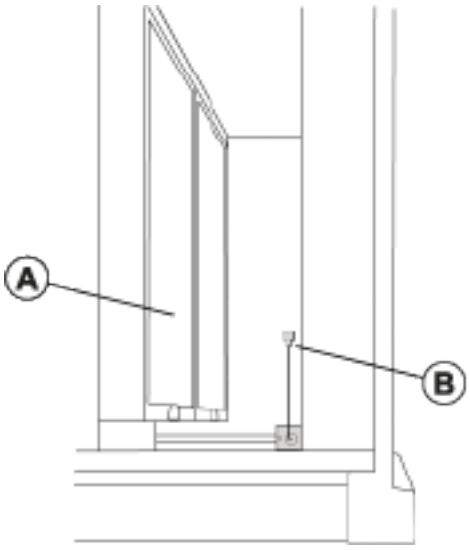
5. For gas heating models equipped with Smart Equipment control, you must move the supply air temperature (SAT) sensor to the working position to ensure proper SAT readings. The SAT sensor is shipped in the supply air compartment.
   a. Move the SAT sensor to the inside of the supply air duct. See Item A in Figure 5.
   b. Use the excess wire available to its full length to drop or mount the SAT sensor in the duct. Avoid close contact with the gas heat exchanger.
   c. Use the shipping bracket to hold the SAT sensor in the supply air stream. See Figure 3 for the factory SAT sensor location and Figure 5 for the sensor relocation.

Figure 3: Supply air temperature sensor



6. For units equipped with an economizer or motorized OD air damper, you must move the return air temperature (RAT) sensor to the working position to ensure correct RAT readings. See Item B in Figure 5.
   a. Move the RAT sensor to the inside of the return air duct verifying that the sensor is at least 6 in. below the unit duct opening. The sensor must read the return air temperature not mixed return air and outdoor air temperatures.
   b. Use the excess wire available to its full length to drop or mount the RAT sensor in the duct.
   c. You can use the shipping bracket to hold the RAT sensor in the return air stream. See Figure 4 for the factory RAT sensor location and Figure 5 for the sensor relocation.

Figure 4: Factory-mounted return air temperature sensor



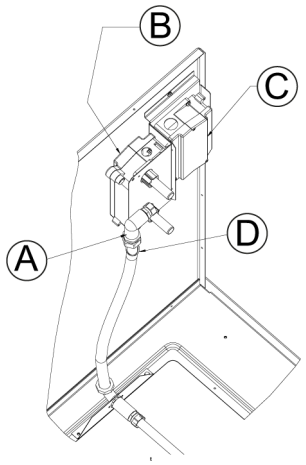
Item	Description
A	Filter rack and filters
B	RAT sensor

Figure 5: Supply and return air ducts

Item	Description
A	Supply air duct
B	Return air duct

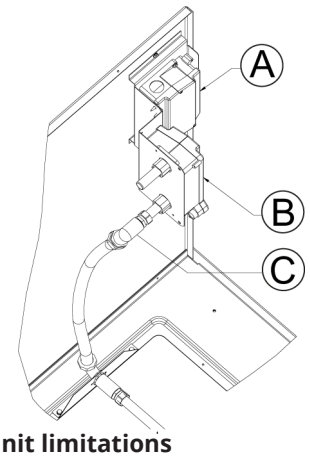
7. If an optional return air smoke detector is installed, you must move the return air sensor from the factory shipped upside down position to the working, right-side up position. Then slide the flex tube over the stub and tighten, see Figure 7.

Figure 6: Return air smoke detector - shipped position



Item	Description
A	Flex tube secured to the bracket
B	Return air sensor
C	Controller
D	Wire tie

Figure 7: Return air smoke detector - working position



Item	Description
A	Controller
B	Return air sensor
C	Flex tube in the working position

Limitations

These units must be installed in accordance with the following standards:

In U.S.A and Canada:

- Gas-Fired Central Furnace Standard , ANSI Z21.47 - CSA 2.3 - latest edition

In U.S.A.:

- National Electrical Code, ANSI/NFPA No. 70 - latest edition
- National Fuel Gas Code, ANSI Z223.1 - latest edition
- Gas-Fired Central Furnace Standard, ANSI Z21.47a. - latest edition
- Local building codes
- Local gas utility requirements

In Canada:

- Canadian Electrical Code, CSA C22.1
- Installation Codes, CSA - B149.1
- Local plumbing and waste water codes, and
- Other applicable local codes.

See to unit application data found in this document.

After installation, gas fired units must be adjusted to obtain a temperature rise within the range specified on the unit rating plate.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's or customer's expense.

The size of a unit for proposed installation should be based on heat loss and heat gain calculation made according to the methods of Air Conditioning Contractors of America (ACCA).

Do not use the furnace for temporary heating of buildings or structures under construction.

Table 1: KL04-06 unit limitations

Model	Size (ton)	Unit voltage	SCCR (kVA)	Unit limitations		
				Applied voltage		Outdoor DB temp
				Minimum	Maximum	Maximum (°F)
KL	04 (3)	208/230-1-60	5	187	252	125
		208/230-3-60	5	187	252	125
		460-3-60	5	432	504	125
		575-3-60	5	540	630	125
KL	05 (4)	208/230-3-60	5	187	252	125
		460-3-60	5	432	504	125
		575-3-60	5	540	630	125
KL	06 (5)	208/230-3-60	5	187	252	125
		460-3-60	5	432	504	125
		575-3-60	5	540	630	125

Location

Use the following guidelines to select a suitable location for these units:

1. The unit is designed for outdoor installation only.
2. The condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either the northern or eastern side of building.
3. Suitable for mounting on roof curb.
4. For ground level installation, use a level concrete slab with a minimum thickness of 4 in. The length and width should be at least 6 in. greater than the unit base rails. Do not tie slab to the building foundation.
5. Roof structures must be able to support the weight of the unit and its options and accessories. The unit must be installed on a solid, level roof curb or appropriate angle iron frame.
6. Maintain level tolerance to 1/2 in. across the entire width and length of unit.

⚠ WARNING

Excessive exposure of this furnace to contaminated combustion air will result in safety and performance related problems. Typical contaminates include: permanent wave solution, chlorinated waxes and cleaners, chlorine based swimming pool chemicals, water softening chemicals, de-icing salts or chemicals, carbon tetrachloride, Halogen type refrigerants, cleaning solvents (e.g. perchloroethylene), printing inks, paint removers, varnishes, hydrochloric acid, cements and glues, anti-static fabric softeners for clothes dryers, masonry acid washing materials.

Clearances

All units require particular clearances for correct operation and service. Installer must make provisions for adequate combustion and ventilation air in accordance with section 5.3 of Air for Combustion and Ventilation of the National Fuel Gas Code, ANSI Z223.1 – Latest Edition (in U.S.A.), or Sections 7.2, 7.3, or 7.4 of Gas Installation Codes, CSA-B149.1 (in Canada) - Latest Edition, and/or applicable provisions of the local building codes. Refer to Table for clearances required for combustible construction, servicing, and correct unit operation.

⚠ WARNING

Do not permit overhanging structures or shrubs to obstruct condenser air discharge outlet, combustion air inlet or vent outlets.

Rigging and handling

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreader bars, whose length exceeds the largest dimension across the unit, **must** be used across the top of the unit.

⚠ CAUTION

If a unit is to be installed on a roof curb other than a Ducted Systems roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.

⚠ CAUTION

Before lifting, make sure the unit weight is distributed equally on the rigging cables so it will lift evenly.

Units may be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose.
LENGTH OF FORKS MUST BE A MINIMUM OF 60 IN.

⚠ CAUTION

All panels must be secured in place when the unit is lifted.
The condenser coils should be protected from rigging cable damage with plywood or other suitable material.

KL04-06 unit weights

Figure 8: Unit 4 point load weight

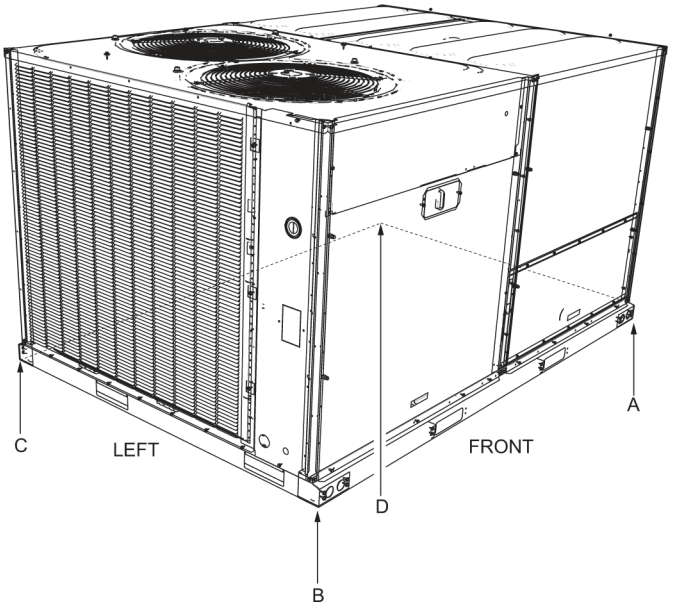


Figure 9: Unit 6 point load weight

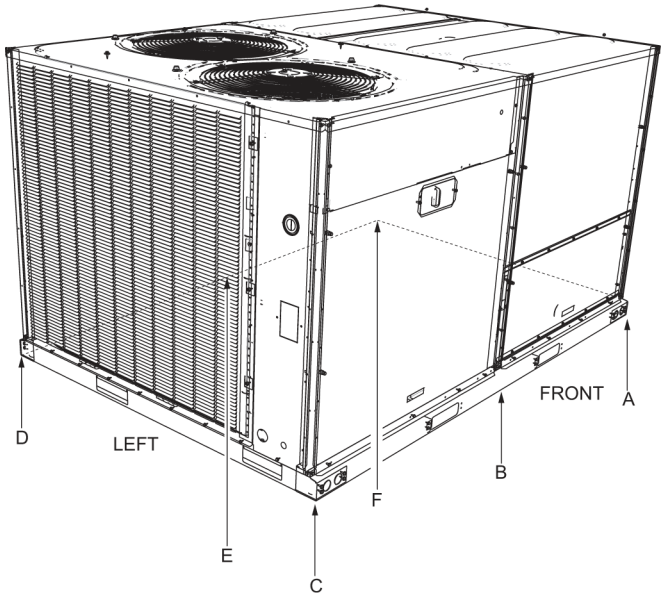


Figure 10: Center of gravity

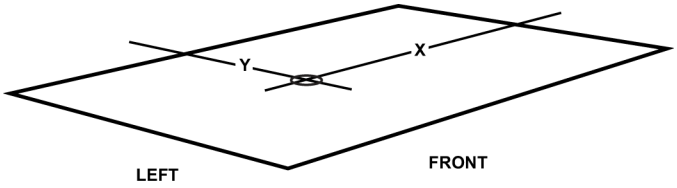


Table 2: KL04-06 corner weights

Model	Size (ton)	Weight (lb)		Center of gravity		4 point load location (lb)				6 point load location (lb)					
		Shipping	Operating	X	Y	A	B	C	D	A	B	C	D	E	F
KLE	04 (3)	486	481	42	27	112	147	126	96	71	85	103	88	73	61
KLE	05 (4)	569	564	36	26	153	145	130	137	103	99	96	86	89	92
KLE	06 (5)	587	582	37	24	141	142	150	149	94	94	95	100	100	99
KLG	04 (3)	560	555	42	27	129	170	146	111	82	98	118	102	84	71
KLG	05 (4)	607	602	36	26	163	155	139	146	109	106	102	92	95	98
KLG	06 (5)	636	631	37	25	160	160	156	155	106	107	107	104	104	103

Table 3: KL04-06 corner weights with MagnaDRY option

Model	Size (ton)	Weight (lb)		Center of gravity		4 point load location (lb)				6 point load location (lb)					
		Shipping	Operating	X	Y	A	B	C	D	A	B	C	D	E	F
KLE	04 (3)	494	489	42	27	114	150	127	97	73	87	104	89	74	62
KLE	05 (4)	579	574	36	26	156	150	132	137	104	102	99	87	90	92
KLE	06 (5)	599	594	37	24	144	145	153	152	96	96	97	102	102	101
KLG	04 (3)	568	563	42	27	131	172	148	112	83	99	120	103	85	72
KLG	05 (4)	617	612	36	26	166	157	141	148	111	108	104	93	96	100
KLG	06 (5)	648	643	37	25	163	163	159	158	108	109	109	106	106	105

Table 4: KL04-06 unit accessory weights

Unit accessory	Weights (lb)
Vertical flow dry bulb economizer small footprint	55
Horizontal flow dry bulb economizer small footprint short	74
Horizontal flow dry bulb economizer small footprint tall	76
Power exhaust vertical flow small footprint	55
Power exhaust horizontal flow small footprint	40
Hail guard kit small short factory installed	18
Hail guard kit small tall factory installed	23
Flue extension kit (1FE0414)	15
Flue extension kit (1FE0415)	17
Flue extension kit (1FE0416)	20
Curb rigid 14 in. small footprint	94
Curb rigid 24 in. small footprint	148

Figure 11: KL04 unit dimensions

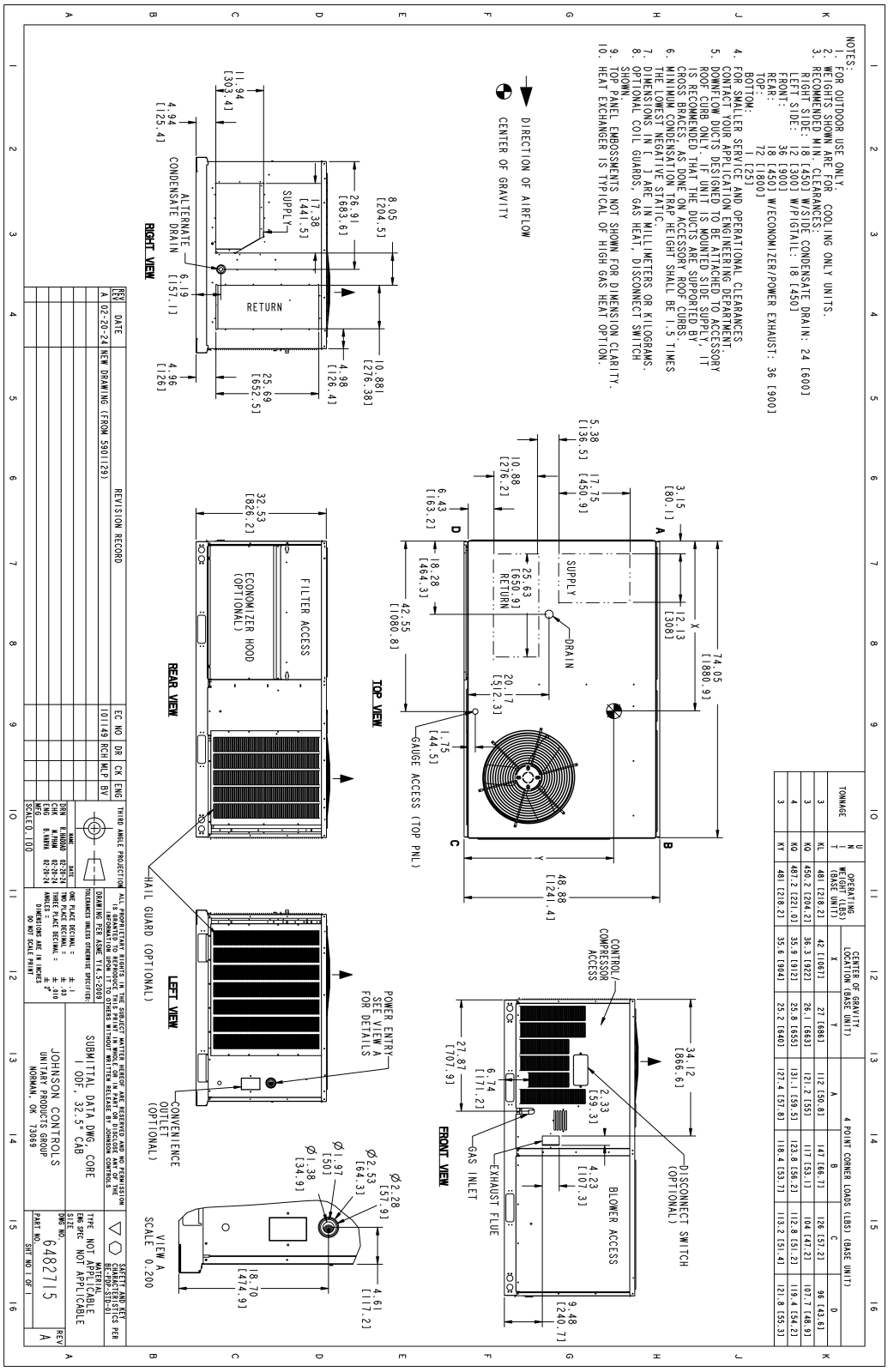


Figure 12: KL05-06 unit dimensions

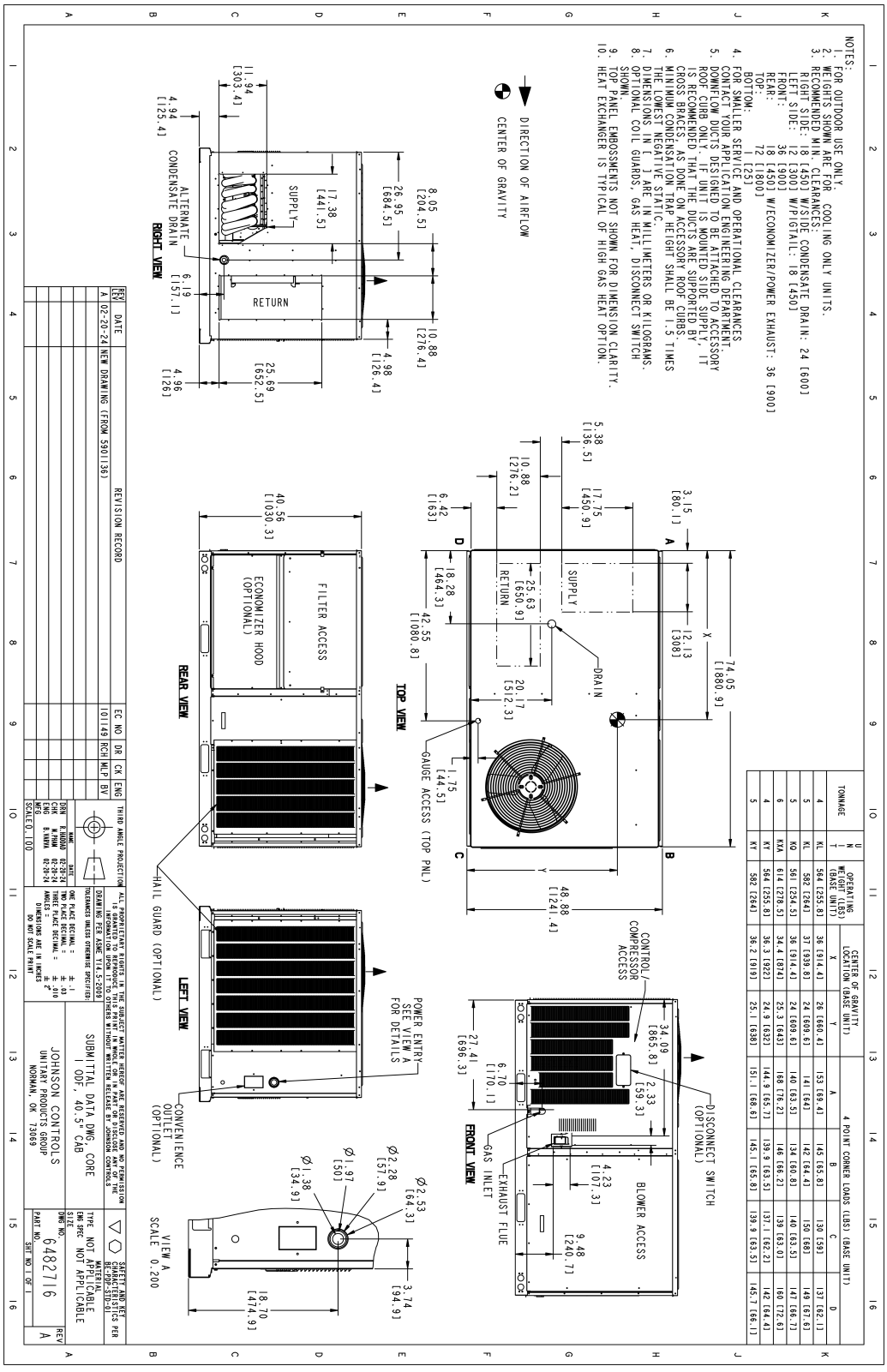
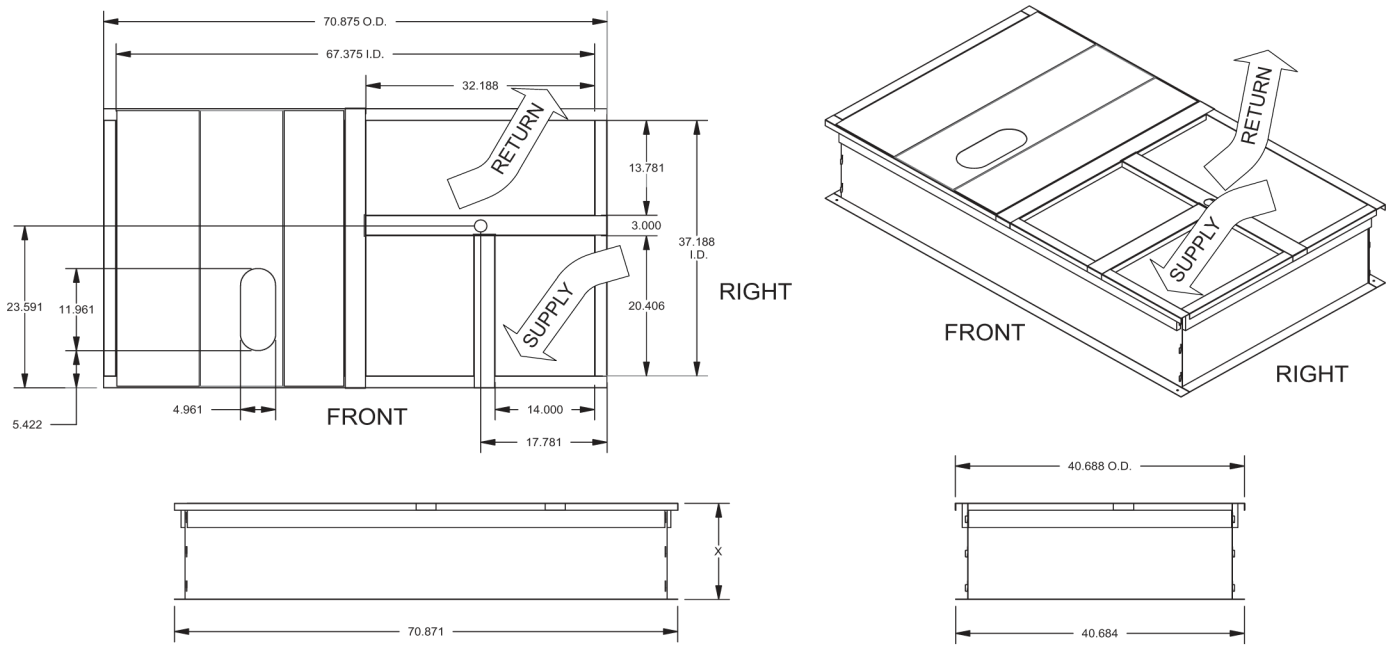


Table 5: KL04-06 unit clearances

Direction	Distance (in.)	Direction	Distance (in.)
Top[1][1]	72	Right	18
Front	36	Left	12
Rear	36[2][2]	Bottom[3][3]	1

1 Units must be installed outdoors. Overhanging structure or shrubs must not obscure condenser air discharge outlet.
2 Units equipped with an economizer or power exhaust. Flue products must not be discharged within 10 ft of the rear of the unit.
3 Units may be installed on combustible floors made from wood or from class A, B, or C roof covering materials.

Figure 13: 1RC0456, 1RC0458 roof curb dimensions



1RC0456 X= 14" Height
1RC0458 X= 24" Height

Notes:
1. Sides, ends and cross support are 18-G90. Deck pans, R/A & S/A supports are 20-G90.
2. Full perimeter wood nailer.
3. Insulated deck pans.

Table 6: Unit models used with 1RC0456, 1RC0458 roof curb

- KL04
- KL05
- KL06

Note: If utilities are required through the base of the unit or through the roof curb the following field installed accessories can be purchased through your dealer or contractor:

1TB0401 - through the base electrical and through the curb gas

1TB0403 - through the base electrical and gas

Ductwork

Ductwork should be designed and sized according to the methods in Manual D of the Air Conditioning Contractors of America (ACCA) or as recommended by any other recognized authority such as ASHRAE or SMACNA.

A closed return duct system should be used. This will not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

The supply and return air duct systems should be designed for the CFM and static pressure requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

See Figure and Figure for bottom and side air duct openings.

Duct covers

Units are shipped with the side duct openings covered and a covering over the bottom of the unit. For side duct application, remove the side duct covers and install over the bottom duct openings. The panels removed from the side duct connections are designed to be reused by securing each panel to its respective bottom duct opening. But keep in mind that the supply and return panels are installed with the painted surface DOWN, facing the bottom duct opening. The gasket must be removed from the insulation side of the duct cover so it is not directly exposed to the heating elements. The panels are secured by sliding them into slots in the back of the duct openings and screwing them to the base of the unit with screws. Use screws removed from original panel location. Seals around duct openings must be tight.

⚠ CAUTION

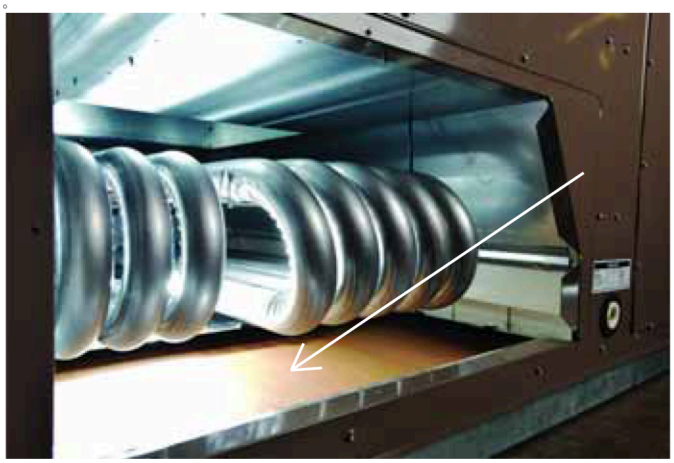
When fastening ductwork to side duct flanges on unit, insert screws through duct flanges only. DO NOT insert screws through casing. Outdoor ductwork must be insulated and water-proofed.

Figure 14: Side duct cover panels

ⓘ **Note:** Shown with duct connection cover panel as shipped.

Figure 15: Bottom return opening for side duct conversion

Figure 16: Bottom supply opening for side duct conversion

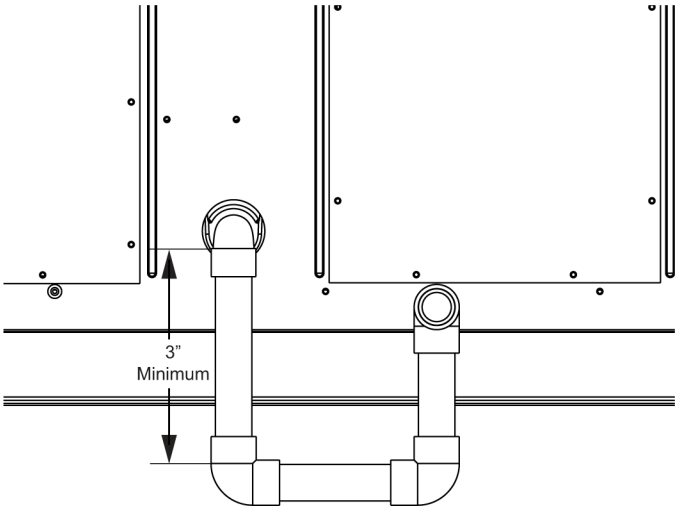


Condensate drain

A side condensate drain is provided to facilitate condensate piping. A condensate drain connection is available through the base pan for piping inside the roof curb. Trap the connection as shown in Figure 17. The trap and drain lines should be protected from freezing.

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain line from the 3/4 in. NPT female connection on the unit to an open drain.

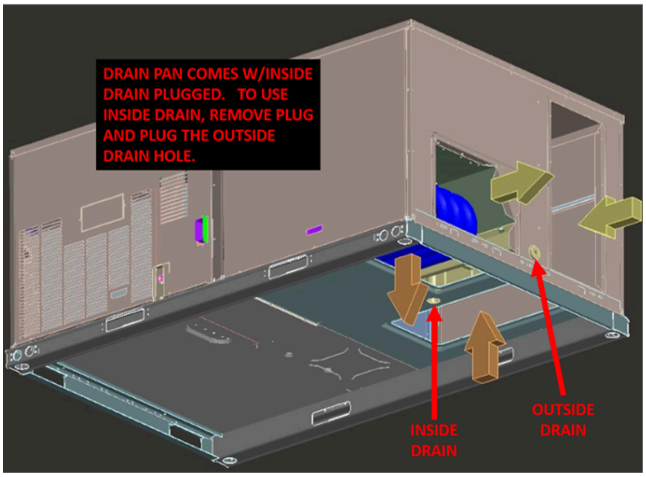
Figure 17: Condensate drain



The condensate drain connection locations are shown in Figure 18. The inside drain plumbing, which is not supplied, must conform to local code.

Note: The drain pan comes with the inside drain plugged. To use the inside drain remove the plug from the inside drain and plug the outside drain hole.

Figure 18: Drain connection locations



Compressors

The compressor used in this product is specifically designed to operate with R-454B refrigerant and cannot be interchanged.

The compressor also uses a refrigerant oil that is extremely hygroscopic, meaning it absorbs water readily. They can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

CAUTION

Do not leave the system open to the atmosphere. Unit damage could occur due to moisture being absorbed by the **refrigerant** in the system. This type of oil is highly susceptible to moisture absorption.

CAUTION

Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When performing any service that may risk exposure of compressor oil to the roof, take precautions to protect roofing.

Procedures which risk oil leakage include, but are not limited to, compressor replacement, repairing refrigerant leaks, replacing refrigerant components such as filter drier, pressure switch, metering device or coil.

Units are shipped with compressor mountings, which are factory-adjusted and ready for operation.

CAUTION

Do not loosen compressor mounting bolts.

Filters

Each unit comes with 2 in. filters. Filters must always be installed ahead of evaporator coil and must be kept clean or replaced with same size and type. Dirty filters reduce the capacity of the unit and result in frosted coils or safety shutdown. See physical data tables for the number and size of filters needed for the unit. The unit should not be operated without filters correctly installed.

Power and control wiring

Field wiring to the unit, fuses, and disconnects must conform to provisions of National Electrical Code (NEC), ANSI/NFPA No. 70 – Latest Edition (in U.S.A.), current Canadian Electrical Code C221, and/or local ordinances. The unit must be electrically grounded in accordance with NEC and CEC as specified above and/or local codes.
Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit rating plate and .

⚠ CAUTION

208/230-3-60 and 208/230-1-60 units control transformers are factory wired for 230 V. Change tap on transformer for 208 V operation. See unit wiring diagram.

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.
A disconnect must be used for these units. Factory installed disconnects are available. If installing a field supplied disconnect, see KL04-06 unit weights for the recommended mounting location.

⚠ CAUTION

Avoid damage to internal components if drilling holes for disconnect mounting.

ⓘ **Note:** Please confirm compliance with local code before mounting a disconnect on the unit as not all local codes allow the mounting of a disconnect on the unit.

Electrical line must be sized correctly to carry the load. **Use copper conductors only**. Each unit must be wired with a separate branch circuit fed directly from the meter panel and correctly fused.

⚠ CAUTION

When connecting electrical power and control wiring to the unit, water-proof connectors must be used so that water or moisture cannot be drawn into the unit during normal operation. The above water-proofing conditions will also apply when installing a field supplied disconnect switch.

⚠ CAUTION

When installing equipment in a facility with a 3 phase high-leg delta power supply, care must be taken to ensure that the high-leg conductor is not attached to either of the two legs of the (single phase, direct drive) X13 or ECM motors. Failure to do so can result in the motor acting erratically or not running at all. Check for the high leg conductor by checking voltage of each phase to ground.
Example: A or L1 phase to ground, voltage reading is 120 V. B or L2 phase to ground, voltage reading is 195 to 208 V. C or L3 phase to ground, voltage reading is 120 V. Therefore B or L2 phase is the high Leg. The high should always be wired to the center or B or L2 tap. **Note**: Check all three phase motors and compressors for correct rotation after making a change. If it is necessary to change 3 phase motor rotation, swap A or L1 and C or L3 only.

Thermostat wiring

A two stage thermostat must be used and should be located on an inside wall approximately 56 in. above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow the manufacturer's instructions enclosed with thermostat for general installation procedure. Eight color-coded, insulated wires should be used to connect the thermostat to the unit. See Table 7 for control wire sizing and maximum length.

Table 7: Control wire sizes

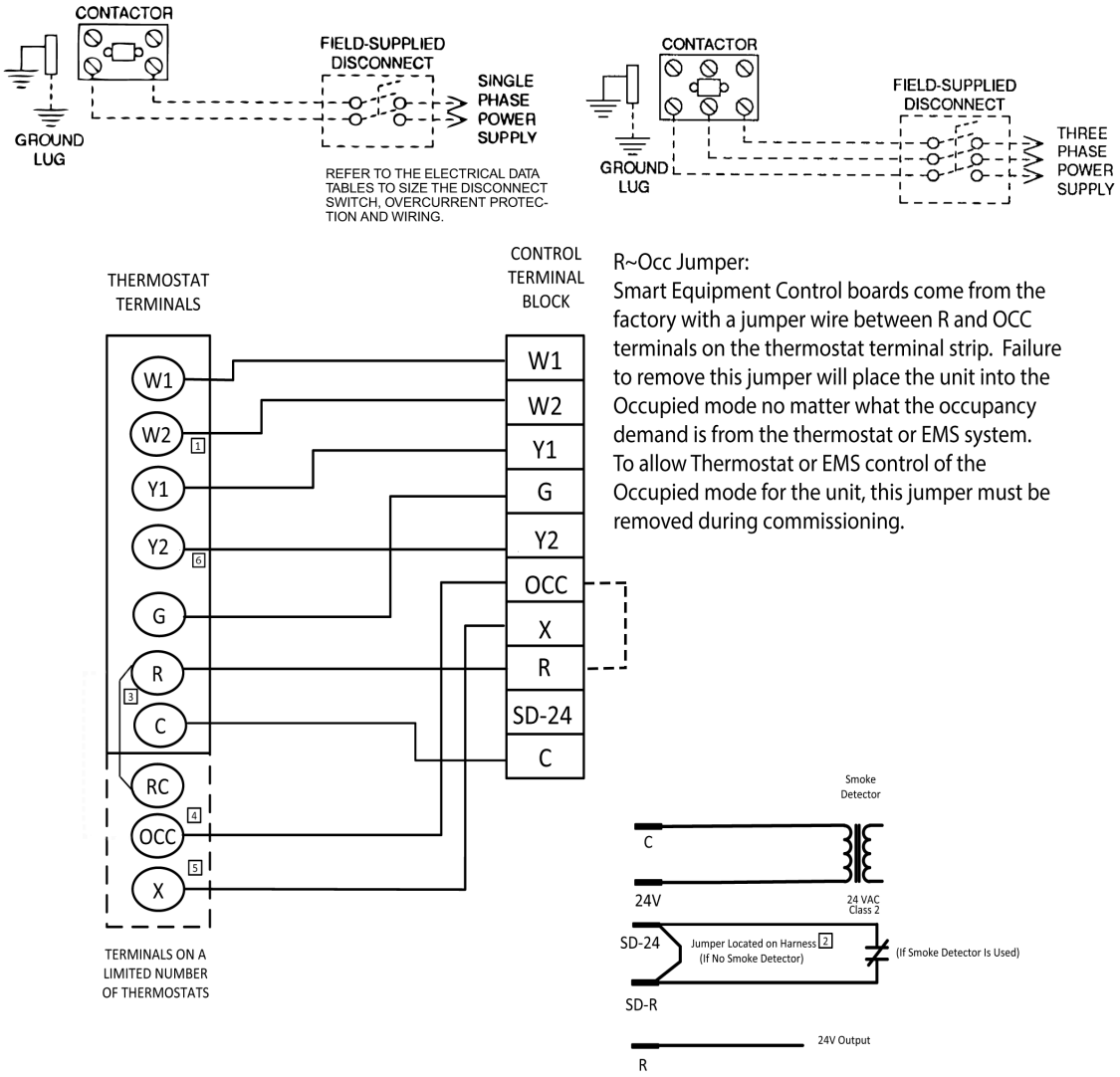
Wire size	Maximum length (ft)
20 AWG	< 150
18 AWG	150 to 250
16 AWG	250 to 500

ⓘ **Note:** The maximum length is measured from the unit to the thermostat and back to the unit.

Typical field power and control wiring

Typical power wiring

Figure 19: Typical Smart Equipment Control wiring



High altitude

High altitude operation for non Ultra-Low NOx units

These units are factory equipped to operate on natural gas at elevations up to 2,000 ft. For propane gas operation or for use at elevations from 2,000 ft to 10,000 ft, install an accessory conversion kit.

High altitude operation for Ultra-Low NOx units only

The 60,000 BTUH Ultra-Low NOx model is factory equipped to operate correctly at altitudes up to 2,000 ft above sea level with no changes. At elevations from 2,000 ft to 5,400 ft above sea level, install a high altitude kit.

The 100,000 BTUH Ultra-Low NOx model is factory equipped to operate correctly at altitudes up to 5,400 ft above sea level, without a high altitude kit.

For both models, at elevations from 2,000 feet to 5,400 feet, reduce the input rate by 2% per 1,000 ft above sea level. See Table 8.

In many cases, this derate will occur automatically if the gas utility reduces the heating value of the gas. This is common in high altitude areas.

Note: It is the responsibility of the installer to:

1. Know the elevation of the installation site.
2. Know the heating value of the natural gas.
3. Check the input rate of the furnace at the time of installation.
4. Adjust the input rate, if necessary.
5. Install the appropriative high altitude conversion kit.

To adjust the gas input rate, adjust the gas valve manifold pressure within the range of 3.0” wc to 4.0” wc.

If you cannot achieve the correct input by adjusting the manifold pressure within this range, replace the gas orifice with a different size.

Table 8: High altitude input rate

Elevation (ft)	60,000 BTU models	100,000 BTU models
Sea level to 2,000	60,000	100,000
2,001 to 2,500	57,000	95,000
2,501 to 3,000	56,400	94,000
3,001 to 3,500	55,800	93,000
3,501 to 4,000	55,200	92,000
4,001 to 4,500	54,600	91,000
4,501 to 5,000	54,000	90,000
5,001 to 5,400	53,500	89,200
above 5,400	not allowed	not allowed

Electrical data

KL04 to 06 standard indoor blower

Table 9: KL04 to KL06 standard indoor blower - without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1] (A)	Min fuse[2] / breaker[2] size (A)	Max fuse[2] / breaker [2] size (A)	Min disconnect[4] rating		MCA[1] w/ pwr exh (amps)	Min fuse[2] / breaker [2] size w/ pwr exh (A)	Max fuse[2] / breaker[2] size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-1-60	14.6	90	23				2.8	6.6	1.5		None	-	-	-	27.7	30	40	28	92	29.2	30	40	29	95
												10625	4.9	1	23.6	37.8	40	40	35	92	39.6	40	40	36	95
												11125	7.9	1	38	55.8	60	60	51	92	57.6	60	60	53	95
	230-1-60	14.6	90	23				2.8	6	1.3		None	-	-	-	27.1	30	40	27	92	28.4	30	40	28	95
												10625	6.5	1	27.1	41.4	45	45	38	92	43	45	45	40	95
												11125	11	1	43.8	62.3	70	70	57	92	63.9	70	70	59	95
	208-3-6	9.9	82	15				2.8	6.6	1.1		None	-	-	-	21.8	25	30	22	84	22.9	25	30	23	87
												10625	4.9	1	13.6	25.3	30	30	23	84	26.6	30	30	24	87
												11125	7.9	1	21.9	35.6	40	40	33	84	37	40	40	34	87
												11625	12	1	33.3	49.9	50	50	46	84	51.3	60	60	47	87
	230-3-6	9.9	82	15				2.8	6	1		None	-	-	-	21.2	25	30	22	84	22.2	25	30	23	86
												10625	6.5	1	15.6	27	30	30	25	84	28.3	30	30	26	86
												11125	11	1	25.3	39.1	40	40	36	84	40.4	45	45	37	86
												11625	16	1	38.5	55.6	60	60	51	84	56.9	60	60	52	86
	460-3-60	4.8	44.3	8				1.6	3.2	0.5		None	-	-	-	10.8	15	15	11	46	11.3	15	15	12	47
												10646	6	1	7.2	13	15	15	12	46	13.6	15	15	13	47
												11146	12	1	13.8	21.3	25	25	20	46	21.9	25	25	20	47
												11446	14	1	16.8	25	25	25	23	46	25.6	30	30	24	47
	575-3-60	3.5	28.7	6				2.8	6	0.4		None	-	-	-	9.6	15	15	10	30	10	15	15	10	30
												11058	9.2	1	8.9	14.1	15	15	13	30	14.6	15	15	13	30
												11458	14	1	13.3	19.6	20	20	18	30	20.1	25	25	19	30
05 (4)	208-3-6	11.9	112	19				2.8	8.4	1.1		None	-	-	-	26.1	30	35	27	114	27.2	30	35	28	117
												10625	4.9	1	13.6	27.5	30	35	27	114	28.9	30	35	28	117
												11125	7.9	1	21.9	37.9	40	40	35	114	39.3	40	40	36	117
												11625	12	1	33.3	52.1	60	60	48	114	53.5	60	60	49	117
	230-3-6	11.9	112	19				2.8	7.6	1		None	-	-	-	25.3	30	35	26	114	26.3	30	35	27	116
												10625	6.5	1	15.6	29	30	35	27	114	30.3	35	35	28	116
												11125	11	1	25.3	41.1	45	45	38	114	42.4	45	45	39	116
												11625	16	1	38.5	57.6	60	60	53	114	58.9	60	60	54	116
	460-3-60	6.8	61.8	11				1.6	4	0.5		None	-	-	-	14.1	15	20	14	64	14.6	15	20	15	65
												10646	6	1	7.2	14.1	15	20	13	64	14.6	15	20	13	65
												11146	12	1	13.8	22.3	25	25	20	64	22.9	25	25	21	65
												11446	14	1	16.8	26	30	30	24	64	26.6	30	30	24	65
	575-3-60	4.8	39	8				2.8	7.6	0.4		None	-	-	-	11.8	15	15	12	40	12.2	15	15	13	41
												11058	9.2	1	8.9	14.9	15	15	14	40	15.4	20	20	14	41
												11458	14	1	13.3	20.4	25	25	19	40	20.9	25	25	19	41

Table 9: KL04 to KL06 standard indoor blower - without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1] (A)	Min fuse[2] / breaker[3] size (A)	Max fuse[2] / breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2] / breaker [3]size w/ pwr exh (A)	Max fuse[2] / breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-3-6	14	150	22				2.8	8.4	1.1		None	-	-	-	28.7	30	40	29	152	29.8	30	40	30	155
												10625	4.9	1	13.6	28.7	30	40	29	152	29.8	30	40	30	155
												11125	7.9	1	21.9	37.9	40	40	35	152	39.3	40	40	36	155
												11625	12	1	33.3	52.1	60	60	48	152	53.5	60	60	49	155
	230-3-6	14	150	22				2.8	7.6	1		None	-	-	-	27.9	30	40	28	152	28.9	30	40	29	154
												10625	6.5	1	15.6	29	30	40	28	152	30.3	35	40	29	154
												11125	11	1	25.3	41.1	45	45	38	152	42.4	45	45	39	154
												11625	16	1	38.5	57.6	60	60	53	152	58.9	60	60	54	154
	460-3-60	6.3	58	10				1.6	4	0.5		None	-	-	-	13.5	15	15	14	60	14	15	15	14	61
												10646	6	1	7.2	14	15	15	13	60	14.6	15	15	13	61
												11146	12	1	13.8	22.3	25	25	20	60	22.9	25	25	21	61
												11446	14	1	16.8	26	30	30	24	60	26.6	30	30	24	61
	575-3-60	5.8	47.8	9				2.8	7.6	0.4		None	-	-	-	13.1	15	15	13	49	13.5	15	15	14	50
												11458	14	1	13.3	20.4	25	25	19	49	20.9	25	25	19	50
												12358	23	1	22.1	31.4	35	35	29	49	31.9	35	35	29	50

Table 10: KL04 to KL06 standard indoor blower - with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1](A)	Min fuse[2]/ breaker[3]size (A)	Max fuse[2] / breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2] / breaker [3]size w/ pwr exh (A)	Max fuse[2] / breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-1-60	14.6	90	23				2.8	6.6	1.5	8.6	None	-	-	-	32	35	45	33	96	33.5	35	45	34	100
												10625	4.9	1	23.6	43.1	45	45	40	96	45	45	45	41	100
												11125	7.9	1	38	61.1	70	70	56	96	63	70	70	58	100
	230-1-60	14.6	90	23				2.8	6	1.3	8.6	None	-	-	-	31.4	35	45	32	96	32.7	35	45	33	99
												10625	6.5	1	27.1	46.8	50	50	43	96	48.4	50	50	45	99
												11125	11	1	43.8	67.6	70	70	62	96	69.3	70	70	64	99
	208-3-6	9.9	82	15				2.8	6.6	1.1	8.6	None	-	-	-	26.1	30	35	27	88	27.2	30	35	28	91
												10625	4.9	1	13.6	30.6	35	35	28	88	32	35	35	29	91
												11125	7.9	1	21.9	41	45	45	38	88	42.4	45	45	39	91
												11625	12	1	33.3	55.3	60	60	51	88	56.6	60	60	52	91
	230-3-6	9.9	82	15				2.8	6	1	8.6	None	-	-	-	25.5	30	35	26	88	26.5	30	35	28	91
												10625	6.5	1	15.6	32.4	35	35	30	88	33.6	35	35	31	91
												11125	11	1	25.3	44.5	45	45	41	88	45.8	50	50	42	91
												11625	16	1	38.5	61	70	70	56	88	62.3	70	70	57	91
	460-3-60	4.8	44.3	8				1.6	3.2	0.5	8.6	None	-	-	-	13	15	15	14	48	13.5	15	15	14	50
												10646	6	1	7.2	15.7	20	20	14	48	16.3	20	20	15	50
												11146	12	1	13.8	23.9	25	25	22	48	24.6	25	25	23	50
												11446	14	1	16.8	27.7	30	30	25	48	28.3	30	30	26	50
	575-3-60	3.5	28.7	6				2.8	6	0.4	8.6	None	-	-	-	11.3	15	15	12	31	11.7	15	15	12	32
												11058	9.2	1	8.9	16.3	20	20	15	31	16.8	20	20	15	32
												11458	14	1	13.3	21.8	25	25	20	31	22.3	25	25	20	32
05 (4)	208-3-6	11.9	112	19				2.8	8.4	1.1	8.6	None	-	-	-	30.4	35	40	32	118	31.5	35	40	33	121
												10625	4.9	1	13.6	32.9	35	40	32	118	34.3	35	40	33	121
												11125	7.9	1	21.9	43.3	45	45	40	118	44.6	45	45	41	121
												11625	12	1	33.3	57.5	60	60	53	118	58.9	60	60	54	121
	230-3-6	11.9	112	19				2.8	7.6	1	8.6	None	-	-	-	29.6	30	40	31	118	30.6	35	40	32	121
												10625	6.5	1	15.6	34.4	35	40	32	118	35.6	40	40	33	121
												11125	11	1	25.3	46.5	50	50	43	118	47.8	50	50	44	121
												11625	16	1	38.5	63	70	70	58	118	64.3	70	70	59	121
	460-3-60	6.8	61.8	11				1.6	4	0.5	8.6	None	-	-	-	16.3	20	20	17	66	16.8	20	20	17	67
												10646	6	1	7.2	16.7	20	20	15	66	17.3	20	20	16	67
												11146	12	1	13.8	24.9	25	25	23	66	25.6	30	30	24	67
												11446	14	1	16.8	28.7	30	30	26	66	29.3	30	30	27	67
	575-3-60	4.8	39	8				2.8	7.6	0.4	8.6	None	-	-	-	13.6	15	15	14	42	14	15	15	15	42
												11058	9.2	1	8.9	17.1	20	20	16	42	17.6	20	20	16	42
												11458	14	1	13.3	22.6	25	25	21	42	23.1	25	25	21	42

Table 10: KL04 to KL06 standard indoor blower - with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1](A)	Min fuse[2]/ breaker[3]size (A)	Max fuse[2] / breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2] / breaker [3]size w/ pwr exh (A)	Max fuse[2] / breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-3-6	14	150	22				2.8	8.4	1.1	8.6	None	-	-	-	33	35	45	34	156	34.1	35	45	35	159
												10625	4.9	1	13.6	33	35	45	34	156	34.3	35	45	35	159
												11125	7.9	1	21.9	43.3	45	45	40	156	44.6	45	45	41	159
												11625	12	1	33.3	57.5	60	60	53	156	58.9	60	60	54	159
	230-3-6	14	150	22				2.8	7.6	1	8.6	None	-	-	-	32.2	35	45	33	156	33.2	35	45	34	159
												10625	6.5	1	15.6	34.4	35	45	33	156	35.6	40	45	34	159
												11125	11	1	25.3	46.5	50	50	43	156	47.8	50	50	44	159
												11625	16	1	38.5	63	70	70	58	156	64.3	70	70	59	159
	460-3-60	6.3	58	10				1.6	4	0.5	8.6	None	-	-	-	15.7	20	20	16	62	16.2	20	20	17	63
												10646	6	1	7.2	16.7	20	20	15	62	17.3	20	20	16	63
												11146	12	1	13.8	24.9	25	25	23	62	25.6	30	30	24	63
												11446	14	1	16.8	28.7	30	30	26	62	29.3	30	30	27	63
	575-3-60	5.8	47.8	9				2.8	7.6	0.4	8.6	None	-	-	-	14.9	15	20	15	50	15.3	20	20	16	51
												11458	14	1	13.3	22.6	25	25	21	50	23.1	25	25	21	51
												12358	23	1	22.1	33.6	35	35	31	50	34.1	35	35	31	51

KL04 to 06 medium indoor blower

Table 11: KL04 to KL14 medium indoor blower - without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1](A)	Min fuse[2]/ breaker[2]size (A)	Max fuse[2]/ breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2]/ breaker [3]size w/ pwr exh (A)	Max fuse[2]/ breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-1-60	14.6	90	23				2.8	16.5	1.5		None	-	-	-	37.6	40	50	39	150	39.1	40	50	41	154
												10625	4.9	1	23.6	50.1	60	60	46	150	52	60	60	48	154
												11125	7.9	1	38	68.1	70	70	63	150	70	80	80	64	154
	230-1-60	14.6	90	23				2.8	16.5	1.3		None	-	-	-	37.6	40	50	39	152	38.9	40	50	40	155
												10625	6.5	1	27.1	54.5	60	60	50	152	56.1	60	60	52	155
												11125	11	1	43.8	75.4	80	80	69	152	77	80	80	71	155
	208-3-6	9.9	82	15				2.8	9	1.1		None	-	-	-	24.2	25	30	25	142	25.3	30	35	26	145
												10625	4.9	1	13.6	28.3	30	30	26	142	29.6	30	35	27	145
												11125	7.9	1	21.9	38.6	40	40	36	142	40	45	45	37	145
												11625	12	1	33.3	52.9	60	60	49	142	54.3	60	60	50	145
	230-3-6	9.9	82	15				2.8	9	1		None	-	-	-	24.2	25	30	25	144	25.2	30	35	26	146
												10625	6.5	1	15.6	30.8	35	35	28	144	32	35	35	29	146
												11125	11	1	25.3	42.9	45	45	39	144	44.1	45	45	41	146
												11625	16	1	38.5	59.4	60	60	55	144	60.6	70	70	56	146
	460-3-60	4.8	44.3	8				1.6	4.6	0.5		None	-	-	-	12.2	15	15	13	75	12.7	15	15	13	76
												10646	6	1	7.2	14.8	15	15	14	75	15.4	20	20	14	76
												11146	12	1	13.8	23	25	25	21	75	23.6	25	25	22	76
												11446	14	1	16.8	26.8	30	30	25	75	27.4	30	30	25	76
	575-3-60	3.5	28.7	6				2.8	3.5	0.4		None	-	-	-	10.7	15	15	11	46	11.1	15	15	12	47
												11058	9.2	1	8.9	15.5	20	20	14	46	16	20	20	15	47
												11458	14	1	13.3	21	25	25	19	46	21.5	25	25	20	47
05 (4)	208-3-6	11.9	112	19				2.8	9	1.1		None	-	-	-	26.7	30	35	27	172	27.8	30	35	29	175
												10625	4.9	1	13.6	28.3	30	35	27	172	29.6	30	35	29	175
												11125	7.9	1	21.9	38.6	40	40	36	172	40	45	45	37	175
												11625	12	1	33.3	52.9	60	60	49	172	54.3	60	60	50	175
	230-3-6	11.9	112	19				2.8	9	1		None	-	-	-	26.7	30	35	27	174	27.7	30	35	28	176
												10625	6.5	1	15.6	30.8	35	35	28	174	32	35	35	29	176
												11125	11	1	25.3	42.9	45	45	39	174	44.1	45	45	41	176
												11625	16	1	38.5	59.4	60	60	55	174	60.6	70	70	56	176
	460-3-60	6.8	61.8	11				1.6	4.6	0.5		None	-	-	-	14.7	15	20	15	93	15.2	20	20	16	94
												10646	6	1	7.2	14.8	15	20	14	93	15.4	20	20	14	94
												11146	12	1	13.8	23	25	25	21	93	23.6	25	25	22	94
												11446	14	1	16.8	26.8	30	30	25	93	27.4	30	30	25	94
	575-3-60	4.8	39	8				2.8	3.5	0.4		None	-	-	-	12.3	15	15	13	57	12.7	15	15	13	58
												11058	9.2	1	8.9	15.5	20	20	14	57	16	20	20	15	58
												11458	14	1	13.3	21	25	25	19	57	21.5	25	25	20	58

Table 11: KL04 to KL14 medium indoor blower - without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1](A)	Min fuse[2]/ breaker[3]size (A)	Max fuse[2] / breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2] / breaker [3]size w/ pwr exh (A)	Max fuse[2] / breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-3-6	14	150	22				2.8	13.2	1.1		None	-	-	-	33.5	35	45	35	210	34.6	35	45	36	213
												10625	4.9	1	13.6	33.5	35	45	35	210	34.9	35	45	36	213
												11125	7.9	1	21.9	43.9	45	50	40	210	45.3	50	50	42	213
												11625	12	1	33.3	58.1	60	60	53	210	59.5	60	60	55	213
	230-3-6	14	150	22				2.8	13.2	1		None	-	-	-	33.5	35	45	35	212	34.5	35	45	36	214
												10625	6.5	1	15.6	36	40	45	35	212	37.3	40	45	36	214
												11125	11	1	25.3	48.1	50	50	44	212	49.4	50	50	45	214
												11625	16	1	38.5	64.6	70	70	59	212	65.9	70	70	61	214
	460-3-60	6.3	58	10				1.6	6.1	0.5		None	-	-	-	15.6	20	20	16	89	16.1	20	20	17	90
												10646	6	1	7.2	16.6	20	20	15	89	17.3	20	20	16	90
												11146	12	1	13.8	24.9	25	25	23	89	25.5	30	30	23	90
												11446	14	1	16.8	28.6	30	30	26	89	29.3	30	30	27	90
	575-3-60	5.8	47.8	9				2.8	4.9	0.4		None	-	-	-	15	20	20	16	66	15.4	20	20	16	66
												11458	14	1	13.3	22.8	25	25	21	66	23.3	25	25	21	66
												12358	23	1	22.1	33.8	35	35	31	66	34.3	35	35	32	66

Table 12: KL04 to KL06 medium indoor blower - with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1](A)	Min fuse[2]/ breaker[3]size (A)	Max fuse[2] / breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2] / breaker [3]size w/ pwr exh (A)	Max fuse[2] / breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-1-60	14.6	90	23				2.8	16.5	1.5	8.6	None	-	-	-	41.9	45	50	44	154	43.4	45	50	46	158
												10625	4.9	1	23.6	55.5	60	60	51	154	57.4	60	60	53	158
												11125	7.9	1	38	73.5	80	80	68	154	75.4	80	80	69	158
	230-1-60	14.6	90	23				2.8	16.5	1.3	8.6	None	-	-	-	41.9	45	50	44	156	43.2	45	50	45	159
												10625	6.5	1	27.1	59.9	60	60	55	156	61.5	70	70	57	159
												11125	11	1	43.8	80.8	90	90	74	156	82.4	90	90	76	159
	208-3-6	9.9	82	15				2.8	9	1.1	8.6	None	-	-	-	28.5	30	35	30	146	29.6	30	35	31	149
												10625	4.9	1	13.6	33.6	35	35	31	146	35	35	35	32	149
												11125	7.9	1	21.9	44	45	45	40	146	45.4	50	50	42	149
												11625	12	1	33.3	58.3	60	60	54	146	59.6	60	60	55	149
	230-3-6	9.9	82	15				2.8	9	1	8.6	None	-	-	-	28.5	30	35	30	148	29.5	30	35	31	150
												10625	6.5	1	15.6	36.1	40	40	33	148	37.4	40	40	34	150
												11125	11	1	25.3	48.3	50	50	44	148	49.5	50	50	46	150
												11625	16	1	38.5	64.8	70	70	60	148	66	70	70	61	150
	460-3-60	4.8	44.3	8				1.6	4.6	0.5	8.6	None	-	-	-	14.4	15	15	15	77	14.9	15	15	16	78
												10646	6	1	7.2	17.4	20	20	16	77	18.1	20	20	17	78
												11146	12	1	13.8	25.7	30	30	24	77	26.3	30	30	24	78
												11446	14	1	16.8	29.4	30	30	27	77	30.1	35	35	28	78
	575-3-60	3.5	28.7	6				2.8	3.5	0.4	8.6	None	-	-	-	12.4	15	15	13	48	12.8	15	15	14	49
												11058	9.2	1	8.9	17.7	20	20	16	48	18.2	20	20	17	49
												11458	14	1	13.3	23.2	25	25	21	48	23.7	25	25	22	49
05 (4)	208-3-6	11.9	112	19				2.8	9	1.1	8.6	None	-	-	-	31	35	40	32	176	32.1	35	40	33	179
												10625	4.9	1	13.6	33.6	35	40	32	176	35	35	40	33	179
												11125	7.9	1	21.9	44	45	45	40	176	45.4	50	50	42	179
												11625	12	1	33.3	58.3	60	60	54	176	59.6	60	60	55	179
	230-3-6	11.9	112	19				2.8	9	1	8.6	None	-	-	-	31	35	40	32	178	32	35	40	33	180
												10625	6.5	1	15.6	36.1	40	40	33	178	37.4	40	40	34	180
												11125	11	1	25.3	48.3	50	50	44	178	49.5	50	50	46	180
												11625	16	1	38.5	64.8	70	70	60	178	66	70	70	61	180
	460-3-60	6.8	61.8	11				1.6	4.6	0.5	8.6	None	-	-	-	16.9	20	20	17	95	17.4	20	20	18	96
												10646	6	1	7.2	17.4	20	20	16	95	18.1	20	20	17	96
												11146	12	1	13.8	25.7	30	30	24	95	26.3	30	30	24	96
												11446	14	1	16.8	29.4	30	30	27	95	30.1	35	35	28	96
	575-3-60	4.8	39	8				2.8	3.5	0.4	8.6	None	-	-	-	14	15	15	15	58	14.4	15	15	15	59
												11058	9.2	1	8.9	17.7	20	20	16	58	18.2	20	20	17	59
												11458	14	1	13.3	23.2	25	25	21	58	23.7	25	25	22	59

Table 12: KL04 to KL06 medium indoor blower - with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1] (A)	Min fuse[2] / breaker[3] size (A)	Max fuse[2] / breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2] / breaker [3]size w/ pwr exh (A)	Max fuse[2] / breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-3-6	14	150	22				2.8	13.2	1.1	8.6	None	-	-	-	37.8	40	50	39	214	38.9	40	50	41	217
												10625	4.9	1	13.6	38.9	40	50	39	214	40.3	45	50	41	217
												11125	7.9	1	21.9	49.3	50	50	45	214	50.6	60	60	47	217
												11625	12	1	33.3	63.5	70	70	58	214	64.9	70	70	60	217
	230-3-6	14	150	22				2.8	13.2	1	8.6	None	-	-	-	37.8	40	50	39	216	38.8	40	50	41	218
												10625	6.5	1	15.6	41.4	45	50	39	216	42.6	45	50	41	218
												11125	11	1	25.3	53.5	60	60	49	216	54.8	60	60	50	218
												11625	16	1	38.5	70	70	70	64	216	71.3	80	80	66	218
	460-3-60	6.3	58	10				1.6	6.1	0.5	8.6	None	-	-	-	17.8	20	20	19	91	18.3	20	20	19	92
												10646	6	1	7.2	19.3	20	20	18	91	19.9	20	20	18	92
												11146	12	1	13.8	27.6	30	30	25	91	28.2	30	30	26	92
												11446	14	1	16.8	31.3	35	35	29	91	31.9	35	35	29	92
	575-3-60	5.8	47.8	9				2.8	4.9	0.4	8.6	None	-	-	-	16.7	20	20	17	67	17.1	20	20	18	68
												11458	14	1	13.3	24.9	25	25	23	67	25.4	30	30	23	68
												12358	23	1	22.1	35.9	40	40	33	67	36.4	40	40	33	68

KL04 to 06 high indoor blower

Table 13: KL04 to KL06 high indoor blower - without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1](A)	Min fuse[2]/ breaker[3]size (A)	Max fuse[2]/ breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse[2]/ breaker [3]size w/ pwr exh (A)	Max fuse[2]/ breaker[3]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-3-6	9.9	82	15				2.8	9	1.1		None	-	-	-	24.2	25	30	25	142	25.3	30	35	26	145
												10625	4.9	1	13.6	28.3	30	30	26	142	29.6	30	35	27	145
												11125	7.9	1	21.9	38.6	40	40	36	142	40	45	45	37	145
												11625	12	1	33.3	52.9	60	60	49	142	54.3	60	60	50	145
	230-3-6	9.9	82	15				2.8	9	1		None	-	-	-	24.2	25	30	25	144	25.2	30	35	26	146
												10625	6.5	1	15.6	30.8	35	35	28	144	32	35	35	29	146
												11125	11	1	25.3	42.9	45	45	39	144	44.1	45	45	41	146
												11625	16	1	38.5	59.4	60	60	55	144	60.6	70	70	56	146
	460-3-60	4.8	44.3	8				1.6	4.6	0.5		None	-	-	-	12.2	15	15	13	75	12.7	15	15	13	76
												10646	6	1	7.2	14.8	15	15	14	75	15.4	20	20	14	76
												11146	12	1	13.8	23	25	25	21	75	23.6	25	25	22	76
												11446	14	1	16.8	26.8	30	30	25	75	27.4	30	30	25	76
	575-3-60	3.5	28.7	6				2.8	3.5	0.4		None	-	-	-	10.7	15	15	11	46	11.1	15	15	12	47
												11058	9.2	1	8.9	15.5	20	20	14	46	16	20	20	15	47
												11458	14	1	13.3	21	25	25	19	46	21.5	25	25	20	47
05 (4)	208-3-6	11.9	112	19				2.8	13.2	1.1		None	-	-	-	30.9	35	40	32	174	32	35	40	33	176
												10625	4.9	1	13.6	33.5	35	40	32	174	34.9	35	40	33	176
												11125	7.9	1	21.9	43.9	45	50	40	174	45.3	50	50	42	176
												11625	12	1	33.3	58.1	60	60	53	174	59.5	60	60	55	176
	230-3-6	11.9	112	19				2.8	13.2	1		None	-	-	-	30.9	35	40	32	181	31.9	35	40	33	183
												10625	6.5	1	15.6	36	40	45	33	181	37.3	40	45	34	183
												11125	11	1	25.3	48.1	50	50	44	181	49.4	50	50	45	183
												11625	16	1	38.5	64.6	70	70	59	181	65.9	70	70	61	183
	460-3-60	6.8	61.8	11				1.6	6.1	0.5		None	-	-	-	16.2	20	20	17	96	16.7	20	20	17	97
												10646	6	1	7.2	16.6	20	20	15	96	17.3	20	20	16	97
												11146	12	1	13.8	24.9	25	25	23	96	25.5	30	30	23	97
												11446	14	1	16.8	28.6	30	30	26	96	29.3	30	30	27	97
	575-3-60	4.8	39	8				2.8	4.9	0.4		None	-	-	-	13.7	15	15	14	65	14.1	15	15	15	66
												11058	9.2	1	8.9	17.3	20	20	16	65	17.8	20	20	16	66
												11458	14	1	13.3	22.8	25	25	21	65	23.3	25	25	21	66

Table 13: KL04 to KL06 high indoor blower - without powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1] (A)	Min fuse[2] / breaker[3] size (A)	Max fuse[2] / breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2] / breaker [3]size w/ pwr exh (A)	Max fuse[2] / breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-3-6	14	150	22				2.8	13.2	1.1		None	-	-	-	33.5	35	45	35	212	34.6	35	45	36	214
												10625	4.9	1	13.6	33.5	35	45	35	212	34.9	35	45	36	214
												11125	7.9	1	21.9	43.9	45	50	40	212	45.3	50	50	42	214
												11625	12	1	33.3	58.1	60	60	53	212	59.5	60	60	55	214
	230-3-6	14	150	22				2.8	13.2	1		None	-	-	-	33.5	35	45	35	219	34.5	35	45	36	221
												10625	6.5	1	15.6	36	40	45	35	219	37.3	40	45	36	221
												11125	11	1	25.3	48.1	50	50	44	219	49.4	50	50	45	221
												11625	16	1	38.5	64.6	70	70	59	219	65.9	70	70	61	221
	460-3-60	6.3	58	10				1.6	6.1	0.5		None	-	-	-	15.6	20	20	16	93	16.1	20	20	17	94
												10646	6	1	7.2	16.6	20	20	15	93	17.3	20	20	16	94
												11146	12	1	13.8	24.9	25	25	23	93	25.5	30	30	23	94
												11446	14	1	16.8	28.6	30	30	26	93	29.3	30	30	27	94
	575-3-60	5.8	47.8	9				2.8	7.7	0.4		None	-	-	-	17.8	20	20	19	74	18.2	20	20	19	75
												11458	14	1	13.3	26.3	30	30	24	74	26.8	30	30	25	75
												12358	23	1	22.1	37.3	40	40	34	74	37.8	40	40	35	75

Table 14: KL04 to KL06 high indoor blower - with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1] (A)	Min fuse[2] / breaker[3] size (A)	Max fuse[2] / breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2] / breaker [3]size w/ pwr exh (A)	Max fuse[2] / breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
04 (3)	208-3-6	9.9	82	15				2.8	9	1.1	8.6	None	-	-	-	28.5	30	35	30	146	29.6	30	35	31	149
												10625	4.9	1	13.6	33.6	35	35	31	146	35	35	35	32	149
												11125	7.9	1	21.9	44	45	45	40	146	45.4	50	50	42	149
												11625	12	1	33.3	58.3	60	60	54	146	59.6	60	60	55	149
	230-3-6	9.9	82	15				2.8	9	1	8.6	None	-	-	-	28.5	30	35	30	148	29.5	30	35	31	150
												10625	6.5	1	15.6	36.1	40	40	33	148	37.4	40	40	34	150
												11125	11	1	25.3	48.3	50	50	44	148	49.5	50	50	46	150
												11625	16	1	38.5	64.8	70	70	60	148	66	70	70	61	150
	460-3-60	4.8	44.3	8				1.6	4.6	0.5	8.6	None	-	-	-	14.4	15	15	15	77	14.9	15	15	16	78
												10646	6	1	7.2	17.4	20	20	16	77	18.1	20	20	17	78
												11146	12	1	13.8	25.7	30	30	24	77	26.3	30	30	24	78
												11446	14	1	16.8	29.4	30	30	27	77	30.1	35	35	28	78
	575-3-60	3.5	28.7	6				2.8	3.5	0.4	8.6	None	-	-	-	12.4	15	15	13	48	12.8	15	15	14	49
												11058	9.2	1	8.9	17.7	20	20	16	48	18.2	20	20	17	49
												11458	14	1	13.3	23.2	25	25	21	48	23.7	25	25	22	49
05 (4)	208-3-6	11.9	112	19				2.8	13.2	1.1	8.6	None	-	-	-	35.2	40	45	37	178	36.3	40	45	38	181
												10625	4.9	1	13.6	38.9	40	45	37	178	40.3	45	45	38	181
												11125	7.9	1	21.9	49.3	50	50	45	178	50.6	60	60	47	181
												11625	12	1	33.3	63.5	70	70	58	178	64.9	70	70	60	181
	230-3-6	11.9	112	19				2.8	13.2	1	8.6	None	-	-	-	35.2	40	45	37	185	36.2	40	45	38	188
												10625	6.5	1	15.6	41.4	45	45	38	185	42.6	45	50	39	188
												11125	11	1	25.3	53.5	60	60	49	185	54.8	60	60	50	188
												11625	16	1	38.5	70	70	70	64	185	71.3	80	80	66	188
	460-3-60	6.8	61.8	11				1.6	6.1	0.5	8.6	None	-	-	-	18.4	20	25	19	98	18.9	20	25	20	100
												10646	6	1	7.2	19.3	20	25	18	98	19.9	20	25	18	100
												11146	12	1	13.8	27.6	30	30	25	98	28.2	30	30	26	100
												11446	14	1	16.8	31.3	35	35	29	98	31.9	35	35	29	100
	575-3-60	4.8	39	8				2.8	4.9	0.4	8.6	None	-	-	-	15.4	20	20	16	67	15.8	20	20	17	68
												11058	9.2	1	8.9	19.4	20	20	18	67	19.9	20	20	18	68
												11458	14	1	13.3	24.9	25	25	23	67	25.4	30	30	23	68

Table 14: KL04 to KL06 high indoor blower - with powered convenience outlet

Size (ton)	Nominal unit voltage	Compressor 1			Compressor 2			OD fan motors (each)	Supply blower motor	Pwr exh motor	Pwr conv outlet	Electric heat field installed kit 2EK045*				MCA[1](A)	Min fuse[2]/ breaker[3]size (A)	Max fuse[2] / breaker [3]size (A)	Min disconnect[4] rating		MCA[1]w/pwr exh (amps)	Min fuse/[2] / breaker [3]size w/ pwr exh (A)	Max fuse[2] / breaker[2]size w/ pwr exh (A)	Min disconnect[4] rating/ pwr exh	
		RLA	LRA	MCC	RLA	LRA	MCC					Model	kW	Stages	Amps				FLA	LRA				FLA	LRA
06 (5)	208-3-6	14	150	22				2.8	13.2	1.1	8.6	None	-	-	-	37.8	40	50	39	216	38.9	40	50	41	219
												10625	4.9	1	13.6	38.9	40	50	39	216	40.3	45	50	41	219
												11125	7.9	1	21.9	49.3	50	50	45	216	50.6	60	60	47	219
												11625	12	1	33.3	63.5	70	70	58	216	64.9	70	70	60	219
	230-3-6	14	150	22				2.8	13.2	1	8.6	None	-	-	-	37.8	40	50	39	223	38.8	40	50	41	226
												10625	6.5	1	15.6	41.4	45	50	39	223	42.6	45	50	41	226
												11125	11	1	25.3	53.5	60	60	49	223	54.8	60	60	50	226
												11625	16	1	38.5	70	70	70	64	223	71.3	80	80	66	226
	460-3-60	6.3	58	10				1.6	6.1	0.5	8.6	None	-	-	-	17.8	20	20	19	95	18.3	20	20	19	96
												10646	6	1	7.2	19.3	20	20	18	95	19.9	20	20	18	96
												11146	12	1	13.8	27.6	30	30	25	95	28.2	30	30	26	96
												11446	14	1	16.8	31.3	35	35	29	95	31.9	35	35	29	96
	575-3-60	5.8	47.8	9				2.8	7.7	0.4	8.6	None	-	-	-	19.5	20	25	21	76	19.9	20	25	21	77
												11458	14	1	13.3	28.4	30	30	26	76	28.9	30	30	27	77
												12358	23	1	22.1	39.4	40	40	36	76	39.9	40	40	37	77

Physical data

KL04 to KL06 physical data

Table 15: KL04 physical data

Component		Models						
		KLG04						KLE04
Nominal tonnage		3						3
AHRI cooling performance direct drive	Gross capacity at AHRI A point (BTU)	38,500						38,500
	AHRI net capacity (BTU)	37,000						37,000
	EER2 230 V/460 V	12.6						12.6
	SEER2 230 V/460 V	16.0						16.0
	EER2 575 V	12.6						12.6
	SEER2 575 V	16.0						16.0
	Nominal cfm	1,300						1,300
	System power 230 V/460 V (kW)	3.0						3.0
	System power 575 V (kW)	3.0						3.0
	Refrigerant type	R-454B						R-454B
	Refrigerant charge (lb-oz)							
	System 1	3-12						3-12
	System 2	—						—
	Refrigerant charge MagnaDRY[1] option (lb-oz)							
	System 1	4-6						4-6
	System 2	—						—
AHRI cooling performance belt drive	Gross capacity at AHRI A point (BTU)	38,500						38,500
	AHRI net capacity (BTU)	36,000						36,000
	EER2 230 V/460 V	11.5						11.5
	SEER2 230 V/460 V	14.1						14.1
	EER2 575 V	11.5						11.5
	SEER2 575 V	14.1						14.1
	Nominal cfm	1,300						1,300
	System power 230 V/460 V (kW)	3.0						3.0
	System power 575 V (kW)	3.0						3.0
	Refrigerant type	R-454B						R-454B
	Refrigerant charge (lb-oz)							
	System 1	3-12						3-12
	System 2	—						—
	Refrigerant charge MagnaDRY[1] option (lb-oz)							
	System 1	4-6						4-6
	System 2	—						—
AHRI heating performance single phase	Heating option	L	D	—	M	E	—	—
	Heating model	Low (Low NOx)	Low	—	Med (Low NOx)	Med	—	—
	First stage heat input (kBTU)	—	—	—	—	—	—	—
	Second stage heat input (kBTU)	56	70	—	90	112	—	—
	First stage heat output (kBTU)	—	—	—	—	—	—	—
	Second stage heat output (kBTU)	45	56	—	72	90	—	—
	AFUE %	—	—	—	—	81	—	—
	FER compliant	—	—	—	—	Yes	—	—
	Number of burners	2	2	—	3	3	—	—
	Number of stages	1	1	—	1	1	—	—
	Temperature rise range (°F)	10-40	20-50	—	35-65	50-80	—	—
	Gas limit setting (°F)	150	150	—	140	140	—	—
	Gas piping connection (in.)	1/2	1/2	—	1/2	1/2	—	—

Table 15: KL04 physical data

Component		Models						
		KLG04						KLE04
Nominal tonnage		3						3
AHRI heating performance three phase	Heating option	L	D	U	M	E	W	—
	Heating model	Low (Low NOx)	Low	Low (Ultra-Low NOx)	Med (Low NOx)	Med	High (Ultra-Low NOx)	—
	First stage heat input (kBTU)	—	49	—	—	82	—	—
	Second stage heat input (kBTU)	56	70	60	90	112	100	—
	First stage heat output (kBTU)	—	39	—	—	66	—	—
	Second stage heat output (kBTU)	45	56	48	72	90	80	—
	Steady state efficiency (%)	80	80	80	80	80	80	—
	Number of burners	2	2	1	3	3	1	—
	Number of stages	1	2	1	1	2	1	—
	Temperature rise range (°F)	28-46	35-58	20-50	44-74	55-78	45-75	—
	Gas limit setting (°F)	150	150	150	140	140	170	—
	Gas piping connection (in.)	1/2	1/2	1/2	1/2	1/2	1/2	—
Dimensions (in.)	Length	74.1						74.1
	Width	48.9						48.9
	Height	32.5						32.5
Operating weight (lb)		555						481
	with MagnaDRY	563						489
Compressors	Type	Scroll						Scroll
	Quantity	1						1
	Unit capacity steps (%)	67/100						67/100
Condenser coil data	Face area (sq ft)	16.3						16.3
	Rows	1						1
	Fins per in.	23						23
	Tube diameter (in./mm)	0.63/16						0.63/16
	Circuitry type	2-pass Microchannel						2-pass Microchannel
Evaporator coil data	Face area (sq ft)	5.5						5.5
	Rows	3						3
	Fins per in.	15						15
	Tube diameter	0.375						0.375
	Circuitry type	Intertwined						Intertwined
	Refrigerant control	TXV						TXV
Reheat option coil data	Face area (sq ft)	3.5						3.5
	Rows	1						1
	Fins per inch	23						23
	Tube diameter (in./mm)	.63/16						.63/16
Condenser fan data	Quantity of fans	1						1
	Fan diameter (in.)	22						22
	Type	Prop						Prop
	Drive type	Direct						Direct
	Quantity of motors	1						1
	Motor hp each	1/3						1/3
	Number of speeds	2						2
	rpm	800/1,000						800/1,000
	Nominal total cfm	3,800						3,800
Evaporator fan data direct drive	Airflow option	A						A
	Quantity	1						1
	Fan size (in.)	10 x 10						10 x 10
	Type	Centrifugal						1,100 Centrifugal
	Motor hp	3/4						3/4
	rpm	1,050						1,050

Table 15: KL04 physical data

Component		Models			
		KLG04		KLE04	
Nominal tonnage		3		3	
Evaporator fan data belt drive	Airflow option	B	C	B	C
	Quantity	1	1	1	1
	Fan size (in.)	10 x 10	10 x 10	10 x 10	10 x 10
	Type	Centrifugal		Centrifugal	
	Motor sheave	1VL34	1VL44	1VL34	1VL44
	Blower sheave	AK46	AK46	AK46	AK46
	Belt	A39	A40	A39	A40
	Motor hp, 1 phase	1.5	—	1.5	—
	Motor max Bhp, 3 phase	2.4	2.4	2.4	2.4
	rpm	1,750	1,750	1,750	1,750
	Frame size	56Y	56Y	56Y	56Y
Filters	Quantity - size	2 - (16 x 25 x 2)[2]		2 - (16 x 25 x 2)[2]	

Note:

1. MagnaDRY reheat option is available in power supply of 208/230/460/575-3-60 options only.
2. 2 in. throwaway, standard, MERV 4 (Minimum Efficiency Reporting Value).

Table 16: KL05 physical data

Component		Models								
		KLG05								KLE05
Nominal tonnage		4								4
AHRI cooling performance direct drive	Gross capacity at AHRI A point (BTU)	52,000								52,000
	AHRI net capacity (BTU)	49,000								49,000
	EER2 230 V/460 V	12.4								12.4
	SEER2 230 V/460 V	16.8								16.8
	EER2 575 V	12.4								12.4
	SEER2 575 V	16.2								16.2
	Nominal cfm	1,650								1,650
	System power 230 V/460 V (kW)	3.9								3.9
	System power 575 V (kW)	3.9								3.9
	Refrigerant type	R-454B								R-454B
	Refrigerant charge (lb-oz)									
	System 1	5-6								5-6
	System 2	—								—
	Refrigerant charge MagnaDRY[1] option (lb-oz)									
	System 1	5-10								5-10
	System 2	—								—
AHRI cooling performance belt drive	Gross capacity at AHRI A point (BTU)	52,000								52,000
	AHRI net capacity (BTU)	49,000								49,000
	EER2 230 V/460 V	12.0								12.0
	SEER2 230 V/460 V	15.2								15.2
	EER2 575 V	12.0								12.0
	SEER2 575 V	14.8								14.8
	Nominal cfm	1,650								1,650
	System power 230V/460V (kW)	4.1								4.1
	System power 575 V (kW)	4.1								4.1
	Refrigerant type	R-454B								R-454B
	Refrigerant charge (lb-oz)									
	System 1	5-6								5-6
	System 2	—								—
	Refrigerant charge MagnaDRY[1] option (lb-oz)									
	System 1	5-10								5-10
	System 2	—								—
AHRI heating performance three phase	Heating options	L	D	U	M	E	W	N	F	—
	Heating model	Low (Low NOx)	Low	Low (Ultra-LowNOx)	Med (Low NOx)	Med	High (Ultra-LowNOx)	High, (Low NOx)	High	—
	First stage heat input (kBTU)	—	49	—	—	82	—	—	100	—
	Second stage heat input (kBTU)	56	70	60	90	112	100	118	145	—
	First stage heat output (kBTU)	—	39	—	—	66	—	—	80	—
	Second stage heat output (kBTU)	45	56	48	72	90	80	94	116	—
	Steady state efficiency (%)	80	80	80	80	80	80	80	80	—
	Number of burners	2	2	1	3	3	1	3	3	—
	Number of stages	1	2	1	1	2	1	1	2	—
	Temperature rise range (°F)	21-35	26-43	15-45	33-56	41-69	30-60	44-73	49-77	—
	Gas limit setting (°F)	150	150	150	140	140	160	150	145	—
	Gas piping connection (in.)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	—
Dimensions (in.)	Length	74.1								74.1
	Width	48.9								48.9
	Height	40.6								40.6
Operating weight (lb)		602								564
	with MagnaDRY	612								574

Table 16: KL05 physical data

Component		Models			
		KLG05		KLE05	
Nominal tonnage		4		4	
Compressors	Type	Scroll		Scroll	
	Quantity	1		1	
	Unit capacity steps (%)	67/100		67/100	
Condenser coil data	Face area (sq ft)	21.1		21.1	
	Rows	1		1	
	Fins per in.	23		23	
	Tube diameter (in./mm)	0.79/20		0.79/20	
	Circuitry Type	2-pass Microchannel		2-pass Microchannel	
Evaporator coil data	Face area (sq ft)	7.3		7.3	
	Rows	3		3	
	Fins per in.	15		15	
	Tube diameter	0.375		0.375	
	Circuitry type	Intertwined		Intertwined	
	Refrigerant control	TXV		TXV	
Reheat option coil data	Face area (sq ft)	4.4		4.4	
	Rows	1		1	
	Fins per inch	23		23	
	Tube diameter (in./mm)	.79/20		.79/20	
Condenser fan data	Quantity of fans	1		1	
	Fan diameter (in.)	22		22	
	Type	Prop		Prop	
	Drive type	Direct		Direct	
	Quantity of motors	1		1	
	Motor hp each	1/3		1/3	
	Number of speeds	1		1	
	rpm	1,100		1,100	
	Nominal total cfm	4,000		4,000	
Evaporator fan data direct drive	Airflow option	A		A	
	Quantity	1		1	
	Fan size (in.)	10 x 10		10 x10	
	Type	Centrifugal		Centrifugal	
	Motor hp	1		1	
	rpm	1,050		1,050	
Evaporator fan data belt drive	Airflow option	B	C	B	C
	Quantity	1	1	1	1
	Fan size (in.)	10 x 10	10 x 10	10 x 10	10 x 10
	Type	Centrifugal		Centrifugal	
	Motor sheave	1VL34	1VL44	1VL34	1VL44
	Blower sheave	AK46	AK46	AK46	AK46
	Belt	A39	A40	A39	A40
	Motor hp, 1 phase	1.5	—	1.5	—
	Motor max Bhp, 3 phase	2.4	2.9	2.4	2.9
	rpm	1,725	1,725	1,725	1,725
	Frame size	56Y	56Y	56Y	56Y
Filters	Quantity - size	4 - (16 x 16 x 2)[2]		4 - (16 x 16 x 2)[2]	

Note:

1. MagnaDRY reheat option is available in power supply of 208/230/460/575-3-60 options only.
2. 2 in. throwaway, standard, MERV 4 (Minimum Efficiency Reporting Value)

Table 17: KL06 physical data

Component		Models								
		KLG06								KLE06
Nominal tonnage		5								5
AHRI cooling performance direct drive	Gross capacity at AHRI A point (BTU)	61,000								61,000
	AHRI net capacity (BTU)	59,000								59,000
	EER2 230 V/460 V	12.5								12.5
	SEER2 230 V/460 V	16.5								16.5
	EER2 575 V	12.4								12.4
	SEER2 575 V	16.4								16.4
	Nominal cfm	1,800								1,800
	System power 230 V/460 V (kW)	4.8								4.8
	System power 575 V (kW)	4.9								4.9
	Refrigerant type	R-454B								R-454B
	Refrigerant charge (lb-oz)									
	System 1	7-8								7-8
	System 2	—								—
	Refrigerant charge MagnaDRY[1] option (lb-oz)									
	System 1	7-14								7-14
	System 2	—								—
AHRI cooling performance belt drive	Gross capacity at AHRI A point (BTU)	61,000								61,000
	AHRI net capacity (BTU)	58,500								58,500
	EER2 230 V/460 V	12.0								12.0
	SEER2 230 V/460 V	15.2								15.2
	EER2 575 V	11.8								11.8
	SEER2 575 V	14.9								14.9
	Nominal cfm	1,800								1,800
	System power 230 V/460 V (kW)	4.9								4.9
	System power 575 V (kW)	5.0								5.0
	Refrigerant type	R-454B								R-454B
	Refrigerant charge (lb-oz)									
	System 1	7-8								7-8
	System 2	—								—
	Refrigerant charge MagnaDRY[1] option (lb-oz)									
	System 1	7-14								7-14
	System 2	—								—
AHRI heating performance three phase	Heating options	L	D	U	M	E	L	W	F	—
	Heating model	Low (Low NOx)	Low	Low (Low NOx)	Low (Ultra-Low NOx)	Med	Low (Low NOx)	High (Ultra-Low NOx)	High	—
	First stage heat input (kBTU)	—	49	—	—	82	—	—	100	—
	Second stage heat input (kBTU)	56	70	60	90	112	100	118	145	—
	First stage heat output (kBTU)	—	39	—	—	66	—	—	80	—
	Second stage heat output (kBTU)	45	56	48	72	90	80	94	116	—
	Steady state efficiency (%)	80	80	80	80	80	80	80	80	—
	Number of burners	2	2	1	3	3	1	3	3	—
	Number of stages	1	2	1	1	2	1	1	2	—
	Temperature rise range (°F)	17-28	21-35	10-40	27-44	33-55	25-55	25-55	43-72	—
	Gas limit setting (°F)	150	150	150	140	140	140	160	140	—
	Gas piping connection (in.)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	—
Dimensions (in.)	Length	74.1								74.1
	Width	48.9								48.9
	Height	40.6								40.6
Operating weight (lb)		631								582
	With MagnaDRY	643								594

Table 17: KL06 physical data

Component		Models			
		KLG06		KLE06	
Nominal tonnage		5		5	
Compressors	Type	Scroll		Scroll	
	Quantity	1		1	
	Unit capacity steps (%)	67/100		67/100	
Condenser coil data	Face area (sq ft)	21.1		21.1	
	Rows	2		2	
	Fins per in	23		23	
	Tube diameter (in./mm)	0.79/20		0.79/20	
	Circuitry type	3-pass Microchannel		3-pass Microchannel	
Evaporator coil data	Face area (sq ft)	7.3		7.3	
	Rows	4		4	
	Fins per in.	15		15	
	Tube diameter	0.375		0.375	
	Circuitry type	Intertwined		Intertwined	
	Refrigerant control	TXV		TXV	
Reheat option coil data	Face area (sq ft)	4.6		4.6	
	Rows	1		1	
	Fins per inch	23		23	
	Tube diameter (in./mm)	1/25		1/25	
Condenser fan data	Quantity of fans	1		1	
	Fan diameter (in.)	22		22	
	Type	Prop		Prop	
	Drive type	Direct		Direct	
	Quantity of motors	1		1	
	Motor hp each	1/3		1/3	
	Number of speeds	2		2	
	rpm	1,000/1,100		1,000/1,100	
	Nominal total cfm	4,600		4,600	
Evaporator fan data direct drive	Airflow option	A		A	
	Quantity	1		1	
	Fan size (in.)	11 x 10		11 x 10	
	Type	Centrifugal		Centrifugal	
	Motor hp	1		1	
	rpm	1,050		1,050	
Evaporator fan data belt drive	Airflow option	B	C	B	C
	quantity	1	1	1	1
	Fan size (in.)	11 x 10	11 x 10	11 x 10	11 x 10
	Type	Centrifugal		Centrifugal	
	Motor sheave	1VL34	1VL44	1VL34	1VL44
	Blower sheave	AK46	AK46	AK46	AK46
	Belt	A37	A39	A37	A39
	Motor hp, 1 phase	1.5	—	1.5	—
	Motor Max Bhp, 3 Phase	2.4	2.9	2.4	2.9
	rpm	1,750	1,750	1,750	1,750
	Frame size	56HZ	56Z	56HZ	56Z
Filters	Quantity - size	4 - (16 x 16 x 2)[2]		4 - (16 x 16 x 2)[2]	

Note:

1. MagnaDRY reheat option is available in power supply of 208/230/460/575-3-60 options only.
2. 2 in. throwaway, standard, MERV 4 (Minimum Efficiency Reporting Value)

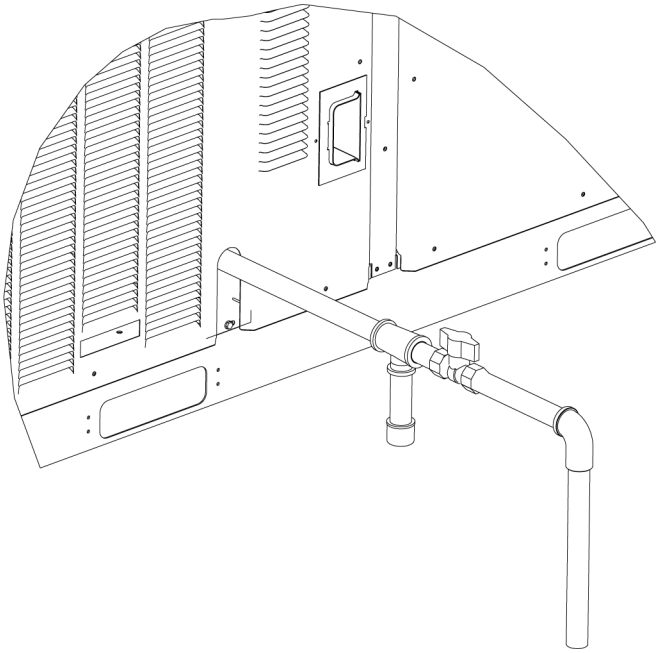
Optional gas heat

These gas-fired heaters have aluminized-steel or optional stainless steel, tubular heat exchangers with spark ignition.

Gas piping

Correct sizing of gas piping depends on the cubic feet per hour of gas flow required, specific gravity of the gas and the length of run. The *National Fuel Gas Code Z223.1 (in U.S.A.)* or the current *Gas Installation Codes CSA-B149.1 (in Canada)* should be followed in all cases unless superseded by local codes or gas utility requirements. Refer to Table 18. The heating value of the gas may differ with locality. The value should be checked with the local gas utility.

Figure 20: Side entry gas piping



ⓘ **Note:** Routing of gas piping must not interfere with the flue or heat compartment access.

Table 18: Gas pipe sizing - capacity of pipe

Length of pipe (ft)	Nominal iron pipe size		
	3/4 in.	1 in.	1 1/4 in.
10	278	520	1050
20	190	350	730
30	152	285	590
40	130	245	500
50	115	215	440
60	105	195	400
70	96	180	370
80	90	170	350
90	84	160	320
100	79	150	305

ⓘ **Note:** Maximum capacity of pipe in cubic feet of gas per hour based upon a pressure drop of 0.3 inch W.C. and 0.6 specific gravity gas.

ⓘ **Note:** There may be a local gas utility requirement specifying a minimum diameter for gas piping. Units require either a 1/2 in. or 3/4 in. pipe connection at the entrance fitting. Line should not be sized smaller than the entrance fitting size.

Table 19: Gas heat supply air

Model (size)	Gas heat description	Opt.	Supply air (CFM)	
			Heating	
			Min	Max
KL04 (3)	Low, NOx	L	900	1480
	Low	D	890	1480
	Med, NOx	M	900	1520
	Med	E	1060	1510
	Low, ULN	U	900	1500
	High, ULN	W	1050	1500
KL05 (4)	Low, NOx	L	1190	1980
	Low	D	1210	1990
	Med, NOx	M	1190	2020
	Med	E	1200	2020
	High, NOx	N	1200	1990
	High	F	1390	2190
	Low, ULN	U	1200	2000
	High, ULN	W	1200	2000
KL06 (5)	Low, NOx	L	1480	2440
	Low	D	1480	2470
	Med, NOx	M	1520	2470
	Med	E	1510	2510
	High, NOx	N	1510	2500
	High	F	1490	2500
	Low, ULN	U	1500	2500
	High, ULN	W	1500	2500

Gas connection

The gas supply line can be routed within the space and roof curb, exiting through the unit's basepan. See Figure to Figure for the gas piping inlet location. Typical supply piping arrangements are shown in Figure 20. All pipe nipples, fittings, and the gas cock are field supplied.

The gas piping recommendations are as follow:

1. A drip leg and a ground joint union must be installed in the gas piping.
2. Where required by local codes, a manual shut-off valve must be installed outside of the unit.
3. Use wrought iron or steel pipe for all gas lines. Pipe dope should be applied sparingly to male threads only. If local codes allow the use of a flexible gas appliance connector, always use a new listed connector. Do not use a connector which has previously serviced another gas appliance.

WARNING

Natural gas may contain some propane. Propane is an excellent solvent and will quickly dissolve white lead and most standard commercial compounds. A special pipe dope must be used when assembling wrought iron or steel pipe. Shellac based compounds such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Clydes's or John Crane may be used.

4. All piping should be cleaned of dirt and scale by hammering on the outside of the pipe and blowing out loose particles. Before initial start-up, be sure that all gas lines external to the unit have been purged of air.
5. The gas supply should be a separate line and installed in accordance with all safety codes as prescribed under .
6. A 1/8 in. NPT plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the unit.
7. After the gas connections have been completed, open the main shut-off valve admitting *normal gas pressure* to the mains.

Note: Check all joints for leaks with soap solution or other material suitable for the purpose. **NEVER USE A FLAME.**

WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

CAUTION

The furnace and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing at pressures in excess of 1/2 psig.

Pressures greater than 1/2 psig will cause gas valve damage resulting in a hazardous condition. If it is subjected to a pressure greater than 1/2 psig, the gas valve must be replaced.

The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig.

WARNING

Threaded joints should be coated with a sealing compound that is resistant to the action of liquefied petroleum gases. **Do not use Teflon tape.**

Check all connections for leaks when piping is completed using a soap solution. **NEVER USE A FLAME.**

WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

Combustion air and flue exhaust

Venting slots in the heating compartment access panel remove the need for a combustion air hood. The gas heat flue exhaust is routed from the unit through a field installed exhaust hood with screen. See Figure 21 for location of hood within the unit and Figure 22 for installation of the hood. If

necessary, a flue exhaust extension may be installed at the point of installation.

Figure 21: Flue exhaust hood shipping location

Figure 22: Flue exhaust hood installed

Options and accessories

Economizer

The economizer can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed economizer accessories include complete instructions for installation.

There are two economizer options. Each is specific to footprint and unit voltage:

1. Vertical flow application with barometric relief standard.
2. Horizontal flow application with barometric relief standard.

Power exhaust

The power exhaust is a field installed accessory. Field installed power exhaust accessories include complete instructions for installation.

There are two field installed power exhaust accessories:

1. Down flow application.
2. Horizontal flow application that requires the purchase of a barometric relief hood.

Condensate overflow switch

Factory- or field-installed option.

Mounted to the unit drain pan, the condensate overflow switch is a float switch that monitors the level of water in the drain pan to shut down unit operation and prevent drain pan overflow within the unit.

VFD Shaft Grounding Device

Factory- or field-installed option.

Available on units with a VFD, the shaft grounding device helps prevent electrical bearing fluting damage to the blower motor shaft by safely diverting harmful shaft voltages and bearing currents to ground, increasing the motor longevity.

Rain hood

All of the hood components, including the mist eliminators, the gasketing and the hardware for assembling, are packaged and located between the condenser coil section and the main unit cabinet, if the unit has factory installed options. If field installed accessories are being installed all parts necessary for the installation comes in the accessory.

Blower phasing

KL units are correctly phased at the factory. Check for proper blower rotation. If the blower rotates in the wrong direction at start-up, the electrical connection to the unit is misphased. Change the phasing of the **Field line connection at the factory or field supplied disconnect** to obtain correct rotation.

CAUTION

When installing equipment in a facility with a 3 phase high-leg delta power supply, care must be taken to ensure that the high-leg conductor is not attached to either of the two legs of the (single phase, direct drive) X13 or ECM motors. Failure to do so can result in the motor acting erratically or not running at all. Check for the high leg conductor by checking voltage of each phase to ground.

Example: A or L1 phase to ground, voltage reading is 120 V. B or L2 phase to ground, voltage reading is 195 V to 208 V. C or L3 phase to ground, voltage reading is 120 V. Therefore B or L2 phase is the high Leg. The high should always be wired to the center or B or L2 tap. **Note**: Check all three phase motors and compressors for proper rotation after making a change. If it is necessary to change 3 phase motor rotation, swap A or L1 and C or L3 only.

Blower rotation

Check for proper supply air blower rotation. If the blower is rotating backwards, the line voltage at the unit point of power connection is misphased (see).

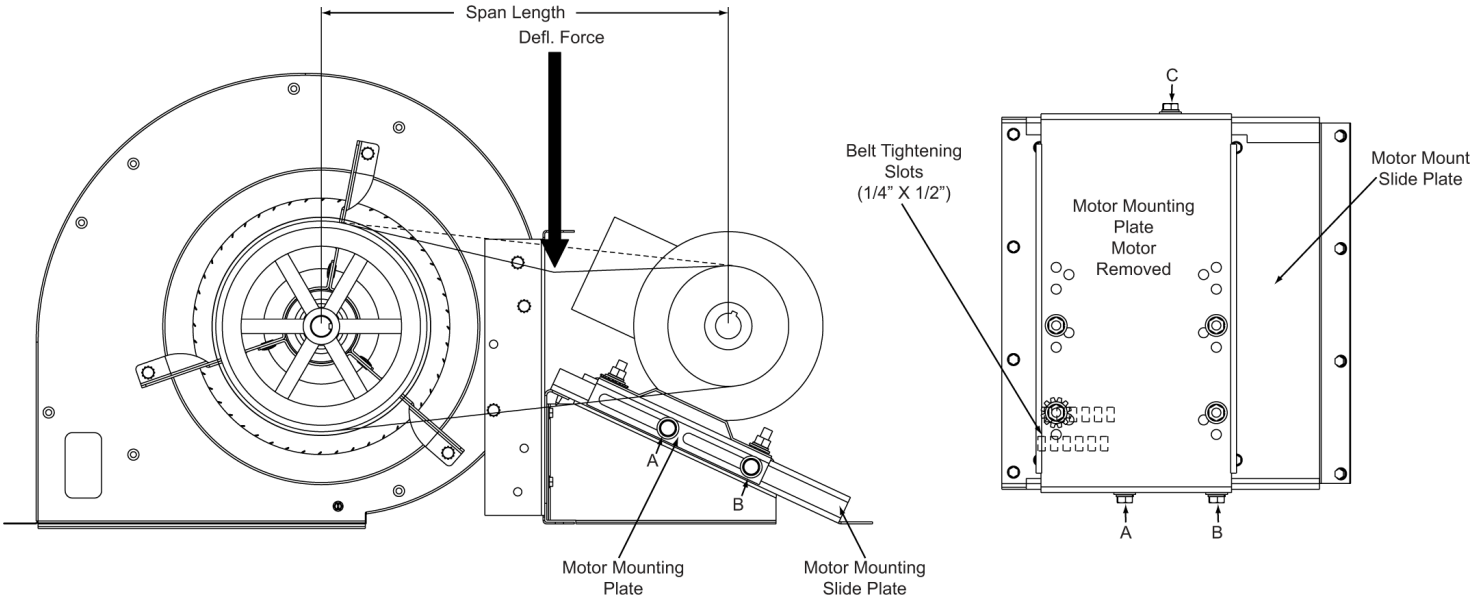
Table 20: Supply air limitations

Model (ton)	Supply air (CFM)	
	Minimum	Maximum
KL04 (3)	900	1500
KL05 (4)	1200	2000
KL06 (5)	1500	2500

Belt tension

The tension on the belt should be adjusted as shown in Figure 23.

Figure 23: Belt adjustment



CAUTION

Procedure for adjusting belt tension below:

1. Loosen the three nuts (A and B on side and C on back) of motor mount slide plate.
2. Adjust tension by placing a flat heat screwdriver into the belt tightening slots (1/4 in. x 1/2 in.) in the motor mount slide plate and applying pressure against the motor mounting plate. See Figure 23.
3. Tighten the three loosened nuts (A, B, and C).
4. Determine the deflection distance from normal position, use a straight edge from sheave to sheave as reference line. Use belt tension checker to apply a perpendicular force to the belt at the midpoint of the span as shown. Deflection distance of 4mm (5/32 in.) is obtained.
5. After adjustments are completed, re-tighten nuts (A, B, and C).

Altitude and temperature correction for CFM, static pressure, and power

The information below should be used to assist in application of product when being applied at altitudes at or exceeding 1000 ft above sea level. The air flow rates listed in the standard blower performance tables are based on standard air at sea level. As the altitude or temperature increases, the density of air decreases. In order to use the indoor blower tables for high altitude applications, certain corrections are necessary. A centrifugal fan is a *constant volume* device. This means that, if the rpm remains constant, the CFM delivered is the same regardless of the density of the air. However, since the air at high altitude is less dense, less static pressure will be generated and less power will be required than a similar application at sea level. Air density correction factors are shown in Table 21 and Figure 24.

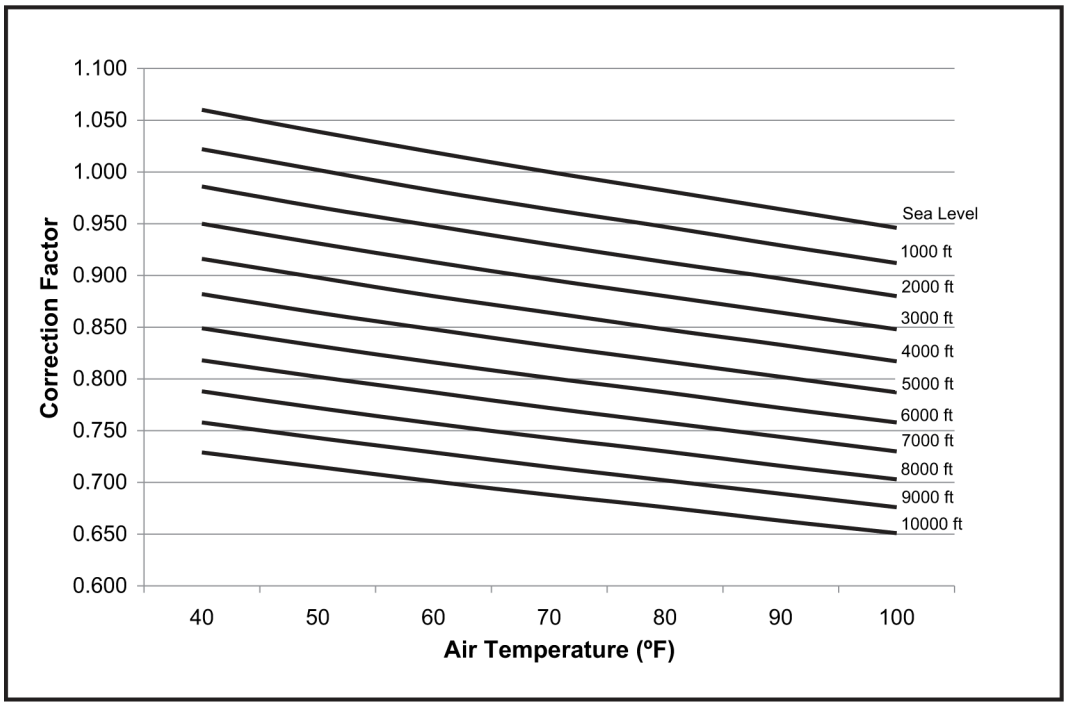
Table 21: Altitude/temperature correction factors

Air temp.	Altitude (ft)										
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
40	1.060	1.022	0.986	0.950	0.916	0.882	0.849	0.818	0.788	0.758	0.729
50	1.039	1.002	0.966	0.931	0.898	0.864	0.832	0.802	0.772	0.743	0.715
60	1.019	0.982	0.948	0.913	0.880	0.848	0.816	0.787	0.757	0.729	0.701

Table 21: Altitude/temperature correction factors

Air temp.	Altitude (ft)										
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
70	1.000	0.964	0.930	0.896	0.864	0.832	0.801	0.772	0.743	0.715	0.688
80	0.982	0.947	0.913	0.880	0.848	0.817	0.787	0.758	0.730	0.702	0.676
90	0.964	0.929	0.897	0.864	0.833	0.802	0.772	0.744	0.716	0.689	0.663
100	0.946	0.912	0.880	0.848	0.817	0.787	0.758	0.730	0.703	0.676	0.651

Figure 24: Altitude/temperature correction factors



The following examples assist in determining the airflow performance of the product at altitude.

Example 1: What are the corrected CFM, static pressure, and BHP at an elevation of 5,000 ft if the airflow performance data is 1,600 CFM, 1.4 IWC and 1.15 BHP? **Solution:** At an elevation of 5,000 ft, the indoor blower still delivers 1,600 CFM if the rpm is unchanged. However, the altitude correction must be used to determine the static pressure and BHP. Since no temperature data is given, we will assume an air temperature of 70°F. The altitude and temperature factors show the correction factor to be 0.832. Corrected static pressure = 1.4 x 0.8 = 1.12 IWC Corrected BHP = 1.15 x 0.8 = 1.66.

Example 2: A system, located at 5,000 ft of elevation, is to deliver 1,600 CFM at a static pressure of 1.4 in. Use the unit blower tables to select the blower speed and the BHP requirement. **Solution:** As in the example above, no temperature information is given so 70°F is assumed. The 1.4 in. static pressure given is at an elevation of 5,000 ft. The first step is to convert this static pressure to equivalent sea level conditions.

Sea level static pressure = 1.4 in. / .8 = 1.75 in.

Enter the supply air blower performance table at 1,600 CFM and static pressure of 1.68 in. The RPM listed will be the same RPM needed at 5,000 ft.

Suppose that the corresponding BHP listed in the table is 2.0. This value must be corrected for elevation.

BHP at 5,000 ft. = 1.15 x .8 = .92

Drive selection

1. Determine side or bottom supply duct application.
2. Determine required airflow.
3. Calculate or measure the amount of external static pressure.
   - Add or deduct any additional static resistance from Table 21.
4. Using the operating point determined from Steps 1, 2, and 3, locate this point on the appropriate supply air blower performance table. Linear interpolation may be necessary.
5. Noting the RPM and BHP from Step 4, locate the appropriate motor and, or drive.
6. Review the BHP compared to the motor options available. Select the appropriate motor and, or drive.

7. Review the RPM range for the motor options available. Select the appropriate drive if multiple drives are available for the chosen motor.
8. Determine turns open to obtain the required operation point.

Airflow performance

Table 22: Example KL06 (5.0 ton) side duct

CFM	[1]Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1500	810	0.49	883	0.60	954	0.70	1023	0.80	1089	0.91	1152	1.02	1213	1.14	1269	1.26	1323	1.40	1373	1.55
1600	831	0.58	904	0.68	975	0.79	1044	0.89	1110	1.00	1173	1.11	1233	1.22	1290	1.35	1344	1.49	1394	1.64
1700	854	0.66	927	0.77	998	0.87	1067	0.98	1133	1.08	1196	1.19	1256	1.31	1313	1.44	1367	1.57	1417	1.72
1800	878	0.75	952	0.86	1023	0.96	1091	1.07	1157	1.17	1221	1.28	1281	1.40	1338	1.52	1391	1.66	1441	1.81
1900	904	0.84	977	0.95	1048	1.05	1117	1.16	1183	1.26	1246	1.37	1306	1.49	1363	1.61	1417	1.75	1467	1.90
2000	931	0.93	1004	1.04	1075	1.15	1144	1.25	1210	1.36	1273	1.47	1333	1.58	1390	1.71	1444	1.84	1494	1.99
2100	959	1.03	1032	1.14	1103	1.24	1172	1.35	1238	1.45	1301	1.56	1361	1.68	1418	1.81	1472	1.94	1522	2.09
2200	988	1.13	1061	1.24	1132	1.35	1201	1.45	1267	1.56	1330	1.67	1390	1.78	1447	1.91	1501	2.04	1550	2.19
2300	1017	1.24	1091	1.35	1162	1.45	1230	1.56	1296	1.66	1359	1.77	1420	1.89	1477	2.02	1530	2.15	1580	2.30
2400	1047	1.36	1121	1.46	1192	1.57	1260	1.67	1326	1.78	1390	1.89	1450	2.01	1507	2.13	1560	2.27	--	--
2500	1078	1.48	1151	1.58	1222	1.69	1291	1.79	1357	1.90	1420	2.01	1480	2.13	1537	2.25	1591	2.39	--	--

	Medium static option with motor rated at 2.4-hp
	High static option with motor rated at 2.9-hp
--	Exceeds recommended blower speed

1 Blower performance includes gas heat exchangers and 2 in. filters. See static resistance table for additional applications. **Note:** See RPM selection table to determine required motor sheave setting and to determine the maximum continuous BHP. kW = 0.857 x BHP

Table 23: Example RPM selection

Model	Size (ton)	Airflow option	Phase	Max BHP	Blower sheave	Motor sheave	6 Turns open	5 Turns open	4 Turns open	3 Turns open	2 Turns open	1 Turns open	Fully closed
KL	06 (5)	Std.	Direct Drive										
		Med.	3	2.4	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		H. Static	3	2.9	AK46	1VL44	N/A	1167	1250	1333	1417	1500	1593

Table 24: Example additional static resistance

Model	Size (ton)	CFM	Cooling only[1]	Economizer [2, 3]	4 in. filters[2]	Electric heat kW[2]							
						6/6.5	9.2/10.5/11	13.8/14/16	16/16.5/17	23	24.8/25.5/27.8	32/33/34	41.7/42.4
KL	06 (5.0)	1800	0.23	0.66	---	0.03	0.03	0.05	---	0.06	---	---	---
		2000	0.28	0.81	---	0.04	0.04	0.07	---	0.08	---	---	---
		2200	0.32	0.95	---	0.06	0.06	0.08	---	0.09	---	---	---
		2400	0.37	1.10	---	0.07	0.07	0.10	---	0.11	---	---	---
		2500	0.50	1.17	---	0.08	0.08	0.11	---	0.12	---	---	---
		1800	0.23	0.66	---	0.03	0.03	0.05	---	0.06	---	---	---
		2000	0.28	0.81	---	0.04	0.04	0.07	---	0.08	---	---	---
		2200	0.32	0.95	---	0.06	0.06	0.08	---	0.09	---	---	---
		2400	0.37	1.10	---	0.07	0.07	0.10	---	0.11	---	---	---
		2500	0.50	1.17	---	0.08	0.08	0.11	---	0.12	---	---	---
		1800	0.23	0.66	---	0.03	0.03	0.05	---	0.06	---	---	---

KL04 to KL06 side duct application (belt drive)

Table 25: KL04 (3.0 ton) side duct

cfm	[1]Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
900	n/a	n/a	874	0.31	972	0.40	1065	0.50	1153	0.60	1236	0.70	1315	0.80	1390	0.89	1460	0.97	1526	1.05
1000	n/a	n/a	887	0.36	985	0.45	1078	0.55	1165	0.65	1249	0.75	1328	0.85	1402	0.94	1472	1.03	1539	1.10
1100	797	0.33	900	0.42	998	0.51	1091	0.61	1179	0.71	1263	0.81	1341	0.91	1416	1.00	1486	1.08	1553	1.16
1200	813	0.40	916	0.48	1014	0.57	1107	0.67	1195	0.77	1279	0.87	1357	0.97	1432	1.06	1502	1.15	1569	1.22
1300	831	0.46	935	0.55	1033	0.64	1126	0.74	1214	0.84	1297	0.94	1376	1.03	1450	1.13	1520	1.21	1583	1.28
1400	852	0.53	956	0.61	1054	0.71	1146	0.80	1234	0.90	1318	1.00	1396	1.10	1471	1.19	1541	1.28	--	--
1500	876	0.59	979	0.68	1077	0.77	1170	0.87	1258	0.97	1341	1.07	1420	1.17	1494	1.26	1565	1.34	--	--

	Medium static option with motor rated at 2.4-hp
	High static option with motor rated at 2.9-hp
--	Exceeds recommended blower speed

1 Blower performance includes gas heat exchangers and 2 in. filters. See static resistance table for additional applications. **Note:** See rpm selection table to determine required motor sheave setting and to determine the maximum continuous bhp. kW = 0.929 x bhp

Table 26: KL05 (4.0 ton) side duct

cfm	[1] Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
1200	840	0.30	927	0.41	1012	0.53	1096	0.65	1177	0.77	1257	0.89	1334	1.01	1411	1.12	1485	1.22	1558	1.31
1300	857	0.35	944	0.47	1029	0.59	1112	0.71	1194	0.83	1273	0.95	1351	1.07	1427	1.18	1502	1.28	1574	1.37
1400	875	0.42	962	0.53	1048	0.65	1131	0.77	1212	0.89	1292	1.01	1370	1.13	1446	1.24	1520	1.34	1593	1.43
1500	897	0.49	984	0.60	1069	0.72	1152	0.84	1233	0.96	1313	1.08	1391	1.20	1467	1.31	1542	1.41	--	--
1600	921	0.56	1008	0.67	1093	0.79	1176	0.91	1258	1.04	1337	1.16	1415	1.27	1491	1.38	1566	1.49	--	--
1700	948	0.64	1035	0.76	1120	0.87	1204	1.00	1285	1.12	1365	1.24	1442	1.36	1518	1.47	1593	1.57	--	--
1800	979	0.73	1066	0.85	1151	0.96	1234	1.08	1315	1.21	1395	1.33	1473	1.44	1549	1.56	--	--	--	--
1900	1012	0.83	1099	0.94	1185	1.06	1268	1.18	1349	1.30	1429	1.42	1507	1.54	1583	1.65	--	--	--	--
2000	1049	0.93	1136	1.04	1222	1.16	1305	1.28	1386	1.40	1466	1.52	1544	1.64	--	--	--	--	--	--

	Medium static option with motor rated at 2.4-hp
	High static option with motor rated at 2.9-hp
--	Exceeds recommended blower speed

1 Blower performance includes gas heat exchangers and 2 in. filters. See static resistance table for additional applications. **Note:** See rpm selection table to determine required motor sheave setting and to determine the maximum continuous bhp. kW = 0.929 x bhp

Table 27: KL06 (5.0 ton) side duct

cfm	[1]Available external static pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
1500	810	0.49	883	0.60	954	0.70	1023	0.80	1089	0.91	1152	1.02	1213	1.14	1269	1.26	1323	1.40	1373	1.55
1600	831	0.58	904	0.68	975	0.79	1044	0.89	1110	1.00	1173	1.11	1233	1.22	1290	1.35	1344	1.49	1394	1.64
1700	854	0.66	927	0.77	998	0.87	1067	0.98	1133	1.08	1196	1.19	1256	1.31	1313	1.44	1367	1.57	1417	1.72
1800	878	0.75	952	0.86	1023	0.96	1091	1.07	1157	1.17	1221	1.28	1281	1.40	1338	1.52	1391	1.66	1441	1.81
1900	904	0.84	977	0.95	1048	1.05	1117	1.16	1183	1.26	1246	1.37	1306	1.49	1363	1.61	1417	1.75	1467	1.90
2000	931	0.93	1004	1.04	1075	1.15	1144	1.25	1210	1.36	1273	1.47	1333	1.58	1390	1.71	1444	1.84	1494	1.99
2100	959	1.03	1032	1.14	1103	1.24	1172	1.35	1238	1.45	1301	1.56	1361	1.68	1418	1.81	1472	1.94	1522	2.09
2200	988	1.13	1061	1.24	1132	1.35	1201	1.45	1267	1.56	1330	1.67	1390	1.78	1447	1.91	1501	2.04	1550	2.19
2300	1017	1.24	1091	1.35	1162	1.45	1230	1.56	1296	1.66	1359	1.77	1420	1.89	1477	2.02	1530	2.15	1580	2.30
2400	1047	1.36	1121	1.46	1192	1.57	1260	1.67	1326	1.78	1390	1.89	1450	2.01	1507	2.13	1560	2.27	--	--
2500	1078	1.48	1151	1.58	1222	1.69	1291	1.79	1357	1.90	1420	2.01	1480	2.13	1537	2.25	1591	2.39	--	--

	Medium static option with motor rated at 2.4-hp
	High static option with motor rated at 2.9-hp
--	Exceeds recommended blower speed

1 Blower performance includes gas heat exchangers and 2 in. filters. See static resistance table for additional applications. **Note:** See rpm selection table to determine required motor sheave setting and to determine the maximum continuous bhp. kW = 0.857 x bhp

KL04 to KL06 side duct application (direct drive)

Table 28: KL04 to KL06 side duct (cooling)

Unit (ton)	Motor speed	Available external static														
		0.2			0.4			0.6			0.8			1.0		
		cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm
KL04 (3)	1 (Low)	894	104	646	707	127	777	578	137	855	—	—	—	—	—	—
	2 (Med/Low)	1079	144	677	936	171	795	793	190	886	692	214	975	521	232	1063
	3 (Med)	1153	166	701	1037	195	812	875	221	913	786	239	986	654	263	1076
	4 (Med/Hi)	1303	224	769	1211	258	876	1097	286	972	924	313	1059	839	326	1117
	5 (Hi)	1728	484	959	1649	515	1027	1579	544	1089	1425	524	1138	1001	405	1168
KL05 (4)	1 (Low)	1063	130	651	900	158	783	698	183	900	—	—	—	—	—	—
	2 (Med/Low)	1421	247	757	1323	282	861	1209	315	958	1064	346	1043	993	368	1116
	3 (Med)	1571	315	809	1496	352	898	1385	389	996	1288	420	1072	1135	444	1147
	4 (Med/Hi)	1669	376	869	1552	416	974	1438	446	1055	1358	472	1113	1045	432	1160
	5 (Hi)	1779	432	878	1707	470	960	1615	511	1042	1516	544	1123	1165	468	1160
KL06 (5)	1 (Low)	1220	120	544	1117	150	634	974	172	728	—	—	—	—	—	—
	2 (Med/Low)	1624	321	713	1557	352	777	1464	383	845	1315	418	924	1224	446	983
	3 (Med)	1875	404	729	1800	443	792	1709	476	863	1608	525	941	1500	572	1017
	4 (Med/Hi)	2146	631	840	2064	692	908	2001	713	954	1932	757	1007	1843	794	1065
	5 (Hi)	2316	812	892	2240	861	954	2181	894	1000	2113	938	1045	2003	946	1093

Table 29: KL04 to KL06 side duct (gas heat)

Unit (ton)	Motor speed	Available external static														
		0.2			0.4			0.6			0.8			1.0		
		cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm
KL04 (3)	1 (Low)	885	109	679	747	131	800	614	147	897	—	—	—	—	—	—
	2 (Med/Low)	1078	153	721	962	175	817	846	200	922	726	226	1026	599	241	1098
	3 (Med)	1153	178	748	1045	199	837	934	226	937	831	251	1031	709	272	1114
	4 (Med/Hi)	1292	243	831	1215	269	915	1111	295	1001	988	317	1086	865	333	1162
	5 (Hi)	1728	484	959	1649	515	1027	1579	544	1089	1425	524	1138	1001	405	1168
KL05 (4)	1 (Low)	1060	146	710	938	167	813	798	190	923	—	—	—	—	—	—
	2 (Med/Low)	1413	272	832	1349	299	906	1266	325	982	1160	352	1070	1042	370	1155
	3 (Med)	1612	388	938	1512	417	1018	1442	438	1073	1368	460	1130	1043	393	1178
	4 (Med/Hi)	1751	472	972	1698	502	1033	1639	534	1088	1543	536	1142	1156	420	1172
	5 (Hi)	2093	768	1116	1944	717	1137	1764	651	1152	1506	552	1163	1146	441	1177
KL06 (5)	1 (Low)	1207	184	652	1088	211	744	966	233	822	847	254	891	722	271	948
	2 (Med/Low)	1575	362	803	1488	391	871	1401	419	929	1319	445	985	1247	469	1037
	3 (Med)	1800	472	839	1714	508	903	1618	539	970	1527	572	1033	1433	599	1089
	4 (Med/Hi)	2049	718	968	1969	768	1026	1902	788	1070	1808	802	1110	1637	744	1132
	5 (Hi)	2218	899	1021	2138	928	1074	2007	907	1105	1846	842	1123	1671	767	1139

ⓘ **Note:** 24 V wires 261/orange, 267/red, 238/white can be moved up to different taps depending on the airflow and static requirements of the application. See the relevant unit's wiring diagram.

KL04 to KL06 bottom duct application (belt drive)

Table 30: KL04 (3.0 ton) bottom duct

cfm	Available external static pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
900	n/a	n/a	878	0.26	976	0.37	1070	0.47	1161	0.58	1247	0.67	1329	0.76	1405	0.85	1477	0.93	1543	1.00
1000	792	0.20	894	0.31	992	0.42	1087	0.52	1177	0.62	1263	0.72	1345	0.81	1422	0.90	1493	0.98	1560	1.05
1100	810	0.26	912	0.37	1010	0.47	1104	0.58	1195	0.68	1281	0.77	1363	0.87	1439	0.95	1511	1.03	1577	1.11
1200	829	0.32	931	0.43	1029	0.54	1124	0.64	1214	0.74	1300	0.84	1382	0.93	1459	1.02	1530	1.10	1593	1.17
1300	850	0.39	952	0.50	1050	0.61	1145	0.71	1235	0.81	1321	0.91	1403	1.00	1480	1.09	1552	1.17	--	--
1400	874	0.47	975	0.58	1073	0.69	1168	0.79	1258	0.89	1344	0.99	1426	1.08	1503	1.17	1575	1.25	--	--
1500	899	0.56	1000	0.67	1098	0.77	1193	0.88	1283	0.98	1370	1.07	1451	1.17	1528	1.25	1600	1.33	--	--

	Medium static option with motor rated at 2.4-hp
	High static option with motor rated at 2.9-hp
--	Exceeds recommended blower speed

Note:

1. Blower performance includes gas heat exchangers and 2 in. filters. See static resistance table for additional applications.**Note:** See rpm selection table to determine required motor sheave setting and to determine the maximum continuous bhp. kW = 0.929 x bhp

Table 31: KL05 (4.0 ton) bottom duct

cfm	Available external static pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
1200	840	0.37	929	0.46	1016	0.56	1101	0.68	1184	0.80	1265	0.93	1345	1.04	1423	1.14	1500	1.22	1576	1.28
1300	858	0.43	947	0.52	1035	0.62	1120	0.74	1203	0.86	1284	0.99	1364	1.10	1442	1.20	1519	1.28	1593	1.34
1400	879	0.49	968	0.58	1055	0.69	1140	0.81	1224	0.93	1305	1.05	1385	1.17	1463	1.27	1540	1.35	--	--
1500	903	0.56	992	0.65	1079	0.76	1164	0.88	1247	1.00	1328	1.12	1408	1.24	1486	1.34	1563	1.42	--	--
1600	929	0.64	1018	0.73	1105	0.83	1190	0.95	1273	1.07	1354	1.20	1434	1.31	1512	1.41	1589	1.49	--	---
1700	957	0.72	1047	0.81	1134	0.91	1219	1.03	1302	1.15	1383	1.28	1463	1.39	1541	1.49	--	--	--	--
1800	989	0.80	1078	0.89	1165	1.00	1250	1.12	1333	1.24	1415	1.36	1494	1.47	1572	1.58	--	--	--	--
1900	1023	0.89	1112	0.98	1199	1.08	1284	1.20	1367	1.33	1449	1.45	1528	1.56	--	--	--	--	--	--
2000	1059	0.98	1149	1.07	1236	1.18	1321	1.29	1404	1.42	1485	1.54	1565	1.65	--	--	--	--	--	--

	Medium static option with motor rated at 2.4-hp
	High static option with motor rated at 2.9-hp
--	Exceeds recommended blower speed

Note:

1. Blower performance includes gas heat exchangers and 2 in. filters. See static resistance table for additional applications.**Note:** See rpm selection table to determine required motor sheave setting and to determine the maximum continuous bhp. kW = 0.929 x bhp

Table 32: KL06 (5.0 ton) bottom duct

cfm	Available external static pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
1500	840	0.48	910	0.58	977	0.67	1042	0.77	1106	0.87	1166	0.98	1225	1.08	1280	1.19	1334	1.30	1384	1.41
1600	866	0.55	935	0.65	1003	0.74	1068	0.84	1131	0.94	1192	1.04	1250	1.15	1306	1.26	1359	1.37	1410	1.48
1700	892	0.63	961	0.72	1029	0.82	1094	0.92	1157	1.02	1218	1.12	1276	1.23	1332	1.33	1385	1.44	1436	1.56
1800	918	0.71	987	0.81	1055	0.90	1120	1.00	1183	1.10	1244	1.21	1302	1.31	1358	1.42	1411	1.53	1462	1.64
1900	944	0.80	1014	0.90	1081	1.00	1146	1.09	1209	1.19	1270	1.30	1329	1.40	1384	1.51	1438	1.62	1488	1.73
2000	971	0.90	1041	1.00	1108	1.09	1174	1.19	1237	1.29	1297	1.39	1356	1.50	1412	1.61	1465	1.72	1516	1.83
2100	999	1.01	1069	1.10	1136	1.20	1202	1.30	1265	1.40	1326	1.50	1384	1.60	1440	1.71	1493	1.82	1544	1.93
2200	1028	1.12	1098	1.21	1165	1.31	1231	1.41	1294	1.51	1355	1.61	1413	1.72	1469	1.82	1522	1.93	1573	2.05
2300	1058	1.24	1128	1.33	1195	1.43	1261	1.53	1324	1.63	1385	1.73	1443	1.83	1499	1.94	1552	2.05	--	--
2400	1090	1.36	1159	1.46	1227	1.55	1292	1.65	1355	1.75	1416	1.85	1474	1.96	1530	2.07	1583	2.18	--	--
2500	1122	1.49	1191	1.59	1259	1.68	1324	1.78	1387	1.88	1448	1.98	1506	2.09	1562	2.20	1615	2.31	--	--

	Medium static option with motor rated at 2.4-hp
	High static option with motor rated at 2.9-hp
--	Exceeds recommended blower speed

Note:

1. Blower performance includes gas heat exchangers and 2 in. filters. See static resistance table for additional applications.**Note:** See rpm selection table to determine required motor sheave setting and to determine the maximum continuous bhp. kW = 0.929 x bhp

KL04 to KL06 bottom duct application (direct drive)

Table 33: KL04 to KL06 bottom duct (cooling)

Unit (ton)	Motor speed	Available external static														
		0.2			0.4			0.6			0.8			1.0		
		cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm
KL04 (3)	1 (Low)	836	112	694	676	130	797	543	139	871	—	—	—	—	—	—
	2 (Med/Low)	1036	157	732	870	177	827	803	198	905	649	217	996	508	236	1074
	3 (Med)	1106	181	760	956	204	849	878	225	928	755	245	1010	616	266	1092
	4 (Med/Hi)	1249	247	842	1153	274	929	1010	299	1007	926	317	1077	815	337	1143
	5 (Hi)	1680	501	997	1622	526	1056	1538	546	1119	1296	485	1153	939	374	1176
KL05 (4)	1 (Low)	1017	143	700	882	160	793	738	183	898	—	—	—	—	—	—
	2 (Med/Low)	1350	272	828	1279	292	893	1196	320	966	1105	347	1048	1003	372	1131
	3 (Med)	1586	406	942	1474	438	1030	1410	451	1065	1334	476	1124	1070	430	1168
	4 (Med/Hi)	1488	345	882	1418	374	954	1357	394	1006	1264	424	1083	1160	442	1155
	5 (Hi)	1677	471	966	1602	507	1034	1543	525	1083	1475	545	1131	1209	465	1162
KL06 (5)	1 (Low)	1180	132	569	1041	156	665	902	184	757	—	—	—	—	—	—
	2 (Med/Low)	1593	337	738	1488	363	805	1381	394	875	1271	425	937	1150	451	997
	3 (Med)	1813	432	764	1711	470	830	1628	499	899	1526	549	978	1416	580	1040
	4 (Med/Hi)	2066	689	895	1999	712	942	1907	761	999	1830	773	1048	1734	809	1100
	5 (Hi)	2237	862	949	2163	882	996	2097	929	1036	1998	946	1085	1815	883	1115

Table 34: KL04 to KL06 bottom duct (gas heat)

Unit (ton)	Motor speed	Available external static														
		0.2			0.4			0.6			0.8			1.0		
		cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm	cfm	watts	rpm
KL04 (3)	1 (Low)	876	114	698	733	133	813	597	149	907	—	—	—	—	—	—
	2 (Med/Low)	1063	158	741	955	180	834	828	204	938	709	227	1030	583	242	1100
	3 (Med)	1135	182	769	1041	208	858	919	229	952	805	254	1045	681	275	1127
	4 (Med/Hi)	1287	251	854	1201	276	937	1096	302	1022	980	328	1107	806	325	1173
	5 (Hi)	1680	501	997	1622	526	1056	1538	546	1119	1296	485	1153	939	374	1176
KL05 (4)	1 (Low)	1038	151	725	908	169	820	757	195	934	—	—	—	—	—	—
	2 (Med/Low)	1382	278	847	1307	302	916	1217	327	994	1108	355	1083	949	359	1164
	3 (Med)	1584	392	948	1473	423	1033	1384	442	1087	1307	462	1144	933	373	1182
	4 (Med/Hi)	1717	473	991	1653	509	1052	1586	538	1107	1443	521	1150	1052	394	1175
	5 (Hi)	2006	738	1132	1854	682	1147	1704	621	1154	1504	552	1168	1073	418	1177
KL06 (5)	1 (Low)	1167	191	658	1061	218	745	940	236	820	833	260	891	701	277	953
	2 (Med/Low)	1536	364	803	1453	392	864	1363	419	924	1293	447	981	1212	471	1037
	3 (Med)	1755	486	851	1671	509	906	1575	543	972	1480	576	1038	1392	604	1092
	4 (Med/Hi)	1999	726	982	1932	761	1030	1860	809	1076	1753	799	1114	1598	749	1134
	5 (Hi)	2170	932	1040	2091	930	1084	1965	910	1109	1798	843	1127	1618	763	1139

ⓘ **Note:** 24 V wires 261/orange, 267/red, 238/white can be moved up to different taps depending on the airflow and static requirements of the application. See the relevant unit's wiring diagram.

RPM selection

Table 35: RPM selection

Model	Size (ton)	Airflow option	Phase	MAX BHP	Blower sheave	Motor sheave	6 Turns open	5 Turns open	4 Turns open	3 Turns open	2 Turns open	1 Turn open	Fully closed
KL	04 (3)	Std.	Direct drive										
		Med.	3	2.4	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		H. Static	3	2.4	AK46	1VL44	N/A	1167	1250	1333	1417	1500	1593

Table 35: RPM selection

Model	Size (ton)	Airflow option	Phase	MAX BHP	Blower sheave	Motor sheave	6 Turns open	5 Turns open	4 Turns open	3 Turns open	2 Turns open	1 Turn open	Fully closed
KL	05 (4)	Std.	Direct drive										
		Med.	3	2.4	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		H. Static	3	2.9	AK46	1VL44	N/A	1167	1250	1333	1417	1500	1593
KL	06 (5)	Std.	Direct Drive										
		Med.	3	2.4	AK46	1VL34	N/A	792	875	958	1042	1125	1208
		H. Static	3	2.9	AK46	1VL44	N/A	1167	1250	1333	1417	1500	1593

Indoor blower specifications

Table 36: Indoor blower specifications

Model	Size (ton)	Airflow option	Motor						Motor sheave			Blower sheave			Belt
			Phase	HP	RPM	Eff.	SF	Frame	Datum dia. (in.)	Bore (in.)	Model	Datum dia. (in.)	Bore (in.)	Model	
KL	04 (3)	Std.	Direct drive												
		Med.	3	2.4	1750	0.87	1.15	56Y	1.9 - 2.9	5/8	1VL34	4.2	3/4	AK46	A39
		H. static	3	2.4	1750	0.87	1.15	56Y	2.8 - 3.8	5/8	1VL44	4.2	3/4	AK46	A40
KL	05 (4)	Std.	Direct drive												
		Med.	3	2.4	1750	0.87	1.15	56Y	1.9 - 2.9	5/8	1VL34	4.2	3/4	AK46	A39
		H. static	3	2.9	1750	0.81	1.15	56Y	2.8 - 3.8	7/8	1VL44	4.2	3/4	AK46	A40
KL	06 (5)	Std.	Direct drive												
		Med.	3	2.4	1750	0.87	1.15	56HZ	1.9 - 2.9	5/8	1VL34	4.2	3/4	AK46	A37
		H. static	3	2.9	1750	0.87	1.15	56Z	2.8 - 3.8	7/8	1VL44	4.2	3/4	AK46	A39

Supply air drive adjustment

CAUTION

Before making any blower speed changes review the installation for any installation errors, leaks or undesirable systems effects that can result in loss of airflow. Even small changes in blower speed can result in substantial changes in static pressure and BHP. BHP and AMP draw of the blower motor will increase by the cube of the blower speed. Static pressure will increase by the square of the blower speed. Only qualified personnel should make blower speed changes, strictly adhering to the fan laws.

At unit start-up, the measured CFM may be higher or lower than the required CFM. To achieve the required CFM, the speed of the drive may have adjusted by changing the datum diameter (DD) of the variable pitch motor sheave as described in the following equation:

$$\left(\frac{\text{Required CFM}}{\text{Measured CFM}}\right) \bullet \text{Existing DD} = \text{New DD}$$

Use the following tables and the DD calculated from the previous equation to adjust the motor variable pitch sheave.

EXAMPLE NEW DATUM DIAMETER

A 4 ton unit was selected to deliver 1,600 CFM with a 1VL34 motor sheave, but the unit is delivering 1,350 CFM. The variable pitch motor sheave is set at 4 turns open.

Use the equation to determine the required DD for the new motor sheave,

$$\left(\frac{1{,}600\ \text{CFM}}{1{,}350\ \text{CFM}}\right) \bullet 2.1\ \text{in.} = 2.48\ \text{in.}$$

Use Table 37 to locate the DD nearest to 2.48 in. Close the sheave to 2 turn open.

EXAMPLE NEW BHP

= (Speed increase)^3 • Original BHP = New BHP

= (Speed increase)^3 • BHP at 1,350 CFM

EXAMPLE NEW MOTOR AMPS

= (Speed increase)^3 • Original Amps = New Amps

= (Speed increase)^3 • Amps at 1,350 CFM

Table 37: Motor sheave datum diameters

1VL34		1VL44		1VP50		1VP56	
Turns open	Datum diameter	Turns open	Datum diameter	Turns open	Datum diameter	Turns open	Datum diameter
0	2.9	0	3.8	0	4.4	0	-
1/2	2.8	1/2	3.7	1/2	4.3	1/2	-
1	2.7	1	3.6	1	4.2	1	5.3
1-1/2	2.6	1-1/2	3.5	1-1/2	4.1	1-1/2	5.2
2	2.5	2	3.4	2	4.0	2	5.1
2-1/2	2.4	2-1/2	3.3	2-1/2	3.9	2-1/2	5.0
3	2.3	3	3.2	3	3.8	3	4.9
3-1/2	2.2	3-1/2	3.1	3-1/2	3.7	3-1/2	4.8
4	2.1	4	3.0	4	3.6	4	4.7
4-1/2	2.0	4-1/2	2.9	4-1/2	3.5	4-1/2	4.6
5	1.9	5	2.8	5	3.4	5	4.5
5-1/2	-	5-1/2	-	5-1/2	-	5-1/2	4.4
6	-	6	-	6	-	6	4.3

CAUTION

Belt drive blower systems MUST be adjusted to the specific static and CFM requirements for the application. The Belt drive blowers are NOT set at the factory for any specific static or CFM. Adjustments of the blower speed and belt tension are REQUIRED. Verify proper sheave alignment; tighten blower pulley and motor sheave set screws after these adjustments. Re-checking set screws and belt tension after 10-12 hrs. run time is recommended.

Table 38: Additional static resistance - KL04-06

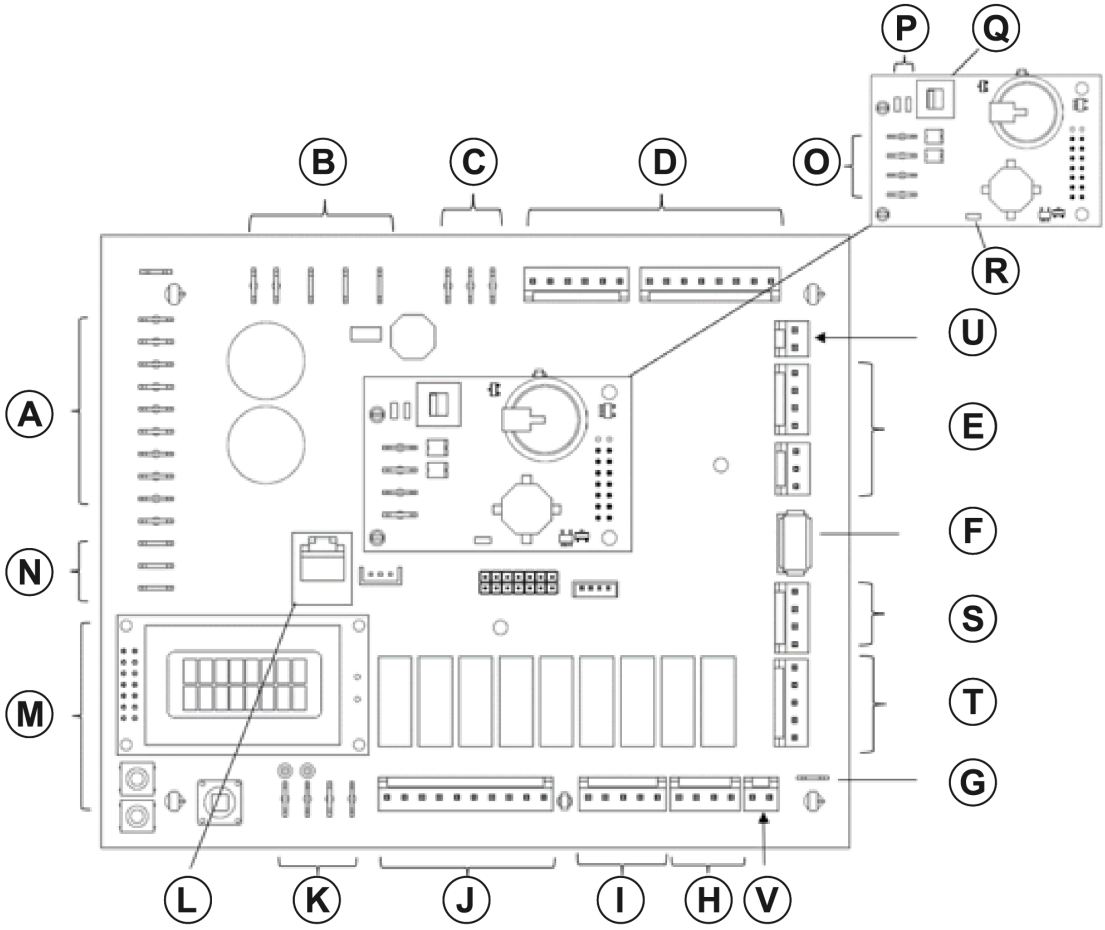
Model	Size (ton)	CFM	Cooling only[1]	Reheat coil [2, 3]	Economizer [2, 3]	4 in. filter[2]	Electric heat kW[2]							
							6/6.5	9.2/10.5/11	13.8/14/16	16/16.5/17	23	24.8/25.5/27.8	32/33/34	41.7/42.4
KL	04 (3.0)	900	0.04	0.03	0.03	—	0.00	0.00	0.01	—	0.01	—	—	—
		1000	0.05	0.03	0.03	—	0.00	0.00	0.02	—	0.02	—	—	—
		1100	0.06	0.04	0.03	—	0.01	0.01	0.02	—	0.03	—	—	—
		1200	0.07	0.04	0.04	—	0.01	0.01	0.02	—	0.03	—	—	—
		1300	0.10	0.04	0.04	—	0.01	0.01	0.03	—	0.03	—	—	—
		1400	0.12	0.05	0.04	—	0.02	0.02	0.03	—	0.04	—	—	—
		1500	0.14	0.06	0.04	—	0.02	0.02	0.04	—	0.04	—	—	—
	05 (4.0)	1200	0.06	0.02	0.04	—	0.01	0.01	0.02	—	0.03	—	—	—
		1300	0.06	0.03	0.05	—	0.01	0.01	0.03	—	0.03	—	—	—
		1400	0.06	0.03	0.06	—	0.02	0.02	0.03	—	0.04	—	—	—
		1500	0.07	0.03	0.07	—	0.02	0.02	0.04	—	0.04	—	—	—
		1600	0.08	0.03	0.08	—	0.02	0.02	0.04	—	0.05	—	—	—
		1700	0.11	0.04	0.09	—	0.03	0.03	0.05	—	0.05	—	—	—
		1800	0.13	0.04	0.09	—	0.03	0.03	0.05	—	0.06	—	—	—
		1900	0.16	0.05	0.10	—	0.04	0.04	0.06	—	0.07	—	—	—
		2000	0.20	0.05	0.11	—	0.04	0.04	0.07	—	0.08	—	—	—
	06 (5.0)	1800	0.23	0.07	0.09	—	0.03	0.03	0.05	—	0.06	—	—	—
		2000	0.28	0.08	0.11	—	0.04	0.04	0.07	—	0.08	—	—	—
		2200	0.32	0.10	0.13	—	0.06	0.06	0.08	—	0.09	—	—	—
		2400	0.37	0.11	0.15	—	0.07	0.07	0.10	—	0.11	—	—	—
		2500	0.50	0.12	0.17	—	0.08	0.08	0.11	—	0.12	—	—	—

Note:

1. Add these values to the available static resistance in the respective blower performance tables.
2. Deduct these values from the available external static pressure shown in the respective blower performance tables.
3. The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

Smart Equipment unit control board

Figure 25: Unit control board



The following tables describe the details of the UCB, see the previous figure for the connection locations.

Table 39: Smart Equipment UCB - thermostat connection strip

Location	Label	Description	Function and comments
A	W1	1st stage heating request, 24 VAC input switched from R	Not effective for cooling-only units
	W2	2nd stage heating request, 24 VAC input switched from R	Not effective for cooling-only units or units with single-stage heat sections
	Y1	1st stage cooling request, 24 VAC input switched from R	
	Y2	2nd stage cooling request, 24 VAC input switched from R	Visible in the display menu when the #ClgStgs parameter is set for 2 or more, also effective for economizer free cooling supply air temperature reset when the #ClgStgs parameter is set for 1 or more
	G	Continuous indoor blower request, 24 VAC input switched from R	
	OCC	Occupancy request, 24 VAC input switched from R	Must have the OccMode parameter set for External to be effective
	X	Hard lockout indicator, 24 volt output to a light thermostat LED	
	R	24 VAC hot for thermostat switching and power	If field-added external accessories for unit shutdown are used, 24 VAC hot return from smoke detector and/or user shutdown relay switching in series
	SD-24	If field-added external accessories for unit shutdown are used, 24 VAC hot out for smoke detector and/or user shutdown relay switching in series	Unit wiring harness jumper plug for factory shutdown accessories must be removed if the switching of field-added external accessories for unit shutdown are wired between thermostat connection strip SD-24 and R
	C	24 VAC common for thermostat power	
	+	MOD BUS	Future
	-	MOD BUS	Future
	C	MOD BUS	Future

Table 40: Smart Equipment UCB - limit, 24 VAC power, and shutdown connections

Location	Label	Description	Function and comments
B	LIMIT	Monitored 24 VAC input through heat section limit switch(es)	If voltage is absent, indicating the heat section is over-temperature, the UCB turns on the indoor blower
	C	24 VAC, 75 VA transformer Common referenced to cabinet ground	Connects through circuit traces to thermostat connection strip C and indoor blower VFD pin C
	24V	24 VAC, 75 VA transformer hot	Powers the UCB microprocessor, connects through circuit trace to the SD 24 terminal
	SD 24	24 VAC hot out for factory accessory smoke detector and/or user shutdown relay switching in series	Connects through circuit trace to thermostat connection strip SD-24. A wiring harness jumper plug connecting SD 24 to SD R is in place if factory accessories for unit shutdown are not used - this jumper plug must be removed if the switching of field-added external accessories for unit shutdown are wired between thermostat connection strip SD-24 and R
	SD R	24 VAC hot return from factory accessory smoke detector and user shutdown relay switching in series	Connects through circuit trace to the R terminal on the upper left of the board
	R	24 VAC hot for switched inputs to the UCB	Connects through circuit trace to the thermostat connection strip R terminal, right FAN OVR pin, right HPS1 pin, right HPS2 pin, lower DFS pin and lower APS pin

Table 41: Smart Equipment UCB - space temperature sensor connections

Location	Label	Description	Function and comments
C	ST	Space Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Positive of VDC circuit (3.625 VDC reading to COM with open circuit), effective if “Thermo- stat-only Control” parameter is set OFF, space sensor override momentary shorts ST to COM to initiate/terminate temporary occupancy
	COM	Common for ST and SSO inputs	Negative of VDC circuit for ST and SSO inputs
	SSO	Space Sensor Offset input from 0 to 20KΩ potentiometer	Positive of VDC circuit (3.625 VDC reading to COM with open circuit), 10KΩ/2.5 VDC is 0°F offset, 0Ω/0 VDC is maximum above offset and 20KΩ/3.4 VDC is maximum below offset from active space temperature setpoint

Table 42: Smart Equipment UCB - temperature sensor connections

Location	Label	Description	Function and comments
D	SAT+	Supply Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading SAT+ to SAT– with open circuit. Used in heat/cool staging cutouts, free cooling operation, demand ventilation operation, comfort ventilation operation, economizer loading operation, VAV cooling operation, hydronic heat operation
	RAT+	Return Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading RAT+ to RAT– with open circuit. Used in return air enthalpy calculation. Substitutes for space temperature if no other space temperature input is present.
	OAT+	Outside Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation but may be a communicated value; 3.625 VDC reading OAT+ to OAT– with open circuit. Used in heat/cool cutouts, low ambient cooling determination, dry bulb free cooling changeover, outside air enthalpy calculation, economizer loading operation, heat pump demand defrost calculation.
	CC1+	#1 refrigerant circuit Condenser Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for heat pump units, not required for A/C units; 3.625 VDC reading CC1+ to CC1– with open circuit. Used in heat pump demand defrost calculation.
	EC1+	#1 refrigerant circuit Evaporator Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading EC1+ to EC1– with open circuit. Used in suction line temperature safety.
	CC2+	#2 refrigerant circuit Condenser Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for 2-compressor heat pump units, not required for 2-compressor A/C units, not active for 1-compressor units; 3.625 VDC reading CC2+ to CC2– with open circuit. Used in heat pump demand defrost calculation.
	EC2+	#2 refrigerant circuit Evaporator Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation of 2-compressor units, not active for 1-compressor units; 3.625 VDC reading EC2+ to EC2– with open circuit. Used in suction line temperature safety.

Table 43: Smart Equipment UCB - pinned connections

Location	Label	Description	Function and comments
E	RAH+	Return Air Humidity input from 0-10 VDC @ 0-100% RH sensor	Input required for reheat units, optional in all other units, may be a communicated value. Used in return air enthalpy calculation, temperature/humidity setpoint reset, reheat operation.
	DCT PRS+	Supply Duct Pressure input from 0-5 VDC @ 0-5" w.c. sensor	Input required for variable air volume units. Used in VAV indoor blower operation.
	C	Common for the VFD output	Negative of the VDC circuit for the VFD output
	VFD	2-10 VDC (0-100%) output for the indoor blower Variable Frequency Drive	Output is active with indoor blower operation. For CV units: this output provides stepped IntelliSpeed control of the indoor blower VFD based on fan-only, cooling stage and heating stage outputs. For VAV units: this output provides control of the indoor blower VFD based on supply duct static pressure input and setpoint.
	VFDFLT	24 VAC hot input from the normally open VFD alarm contact	The VFD alarm contact switches from R within the unit wiring harness. 24 VAC input results in unit shutdown and a "VFD fault" alarm

Table 44: Smart Equipment UCB - USB connector

Location	Label	Description	Function and comments
F	J10	Type A female Universal Serial Bus connector	Used for backup, restoration, and copying of board parameters as well as board software updating through a flash drive
	J15	Factory wired SA Bus connector	

Table 45: Smart Equipment UCB - 24 V terminal

Location	Label	Description	Function and comments
G	24V FOR OUTPUTS	24 VAC hot for H1, H2, CN-FAN, AUX HGR, FAN C1 and C2 output relay contact switching	Output relay circuitry is isolated from other UCB components and the 24 VAC hot source may be from a second transformer in the unit

Table 46: Smart Equipment UCB - heat section connections

Location	Label	Description	Function and comments
H	H1	24 VAC hot output for heat section stage 1	Not effective for cooling-only units. Output if demand is present and permissions allow one stage or two stages of heat section operation
	H2	24 VAC hot output for heat section stage 2	Not effective for cooling-only units or units with single-stage heat sections. Output if demand is present and permissions allow two stages of heat section operation
	MV	24 VAC hot input confirming heat section operation	Sourced from gas valve in gas heat units or first stage heat contactor in electric heat units. Input within 5 minutes from initiation of H1 output initiates the "Heat On Fan Delay" timer, loss of input following the termination of H1 output initiates the "Heat On Fan Delay" timer, no input within 5 minutes from initiation of H1 output initiates an "Ignition Failure" alarm, input for longer than 5 minutes without H1 output initiates a "Gas Valve Mis-wire" alarm

Table 47: Smart Equipment UCB - pin cooling and fan output

Location	Label	Description	Function and comments
I	CN-FAN	24 VAC hot output for the condenser fan contactor coil	Output with either C1 or C2 output; interrupted during defrost cycle for heat pump units
	AUX HGR	24 VAC hot output for hot gas reheat components	Effective only for reheat units, output with reheat operation
	FAN	24 VAC hot output for indoor blower contactor coil/indoor blower VFD enable relay coil	Output with heat/cool operation, G input or schedule demand
	C1	24 VAC hot output for compressor 1	If demand is present and permissions allow compressor 1 operation; output with compressor cooling, comfort ventilation cooling, reheat or heat pump heating demands
	C2	24 VAC hot output for compressor 2	Not effective for one stage compressor UCBs. If demand is present and permissions allow compressor 2 operation; output with compressor cooling, comfort ventilation cooling or heat pump heating demands

Table 48: Smart Equipment UCB - refrigerant circuit safety switch and indoor blower overload connections

Location	Label	Description	Function and comments
J	HPS1 (right pin)	24 VAC hot out for refrigerant circuit 1 High Pressure Switch	Connects through circuit trace to the R terminal
	HPS1 (left pin)	24 VAC hot return from refrigerant circuit 1 High Pressure Switch	Input is only considered if C1 output is needed; input must be present to allow C1 output. Three HPS1 trips in a two hour period cause a “High Pressure Switch 1 Lockout” and C1 output is then prevented until alarm reset. Connects through circuit trace to the right LPS1 pin.
	LPS1 (right pin)	24 VAC hot out for refrigerant circuit 1 Low Pressure Switch	Connects through circuit trace to the left HSP1 pin
	LPS1 (left pin)	24 VAC hot return from refrigerant circuit 1 Low Pressure Switch	Input is only considered after 30 seconds of C1 output; afterwards, input must be present to allow C1 output. Three LPS1 trips in a one hour period cause a “Low Pressure Switch 1 Lockout” and C1 output is then prevented until alarm reset.
	HPS2 (right pin)	24 VAC hot out for refrigerant circuit 2 High Pressure Switch	Not effective for one stage compressor UCBs. Connects through circuit trace to the R terminal
	HPS2 (left pin)	24 VAC hot return from refrigerant circuit 2 High Pressure Switch	Not effective for one stage compressor UCBs. Input is only considered if C2 output is needed; input must be present to allow C1 output. Three HPS2 trips in a two hour period cause a “High Pressure Switch 1 Lockout” and C2 output is then prevented until alarm reset. Connects through circuit trace to the right LPS2 pin.
	LPS2 (right pin)	24 VAC hot out for refrigerant circuit 2 Low Pressure Switch	Not effective for one stage compressor UCBs. Connects through circuit trace to the left HSP2 pin
	LPS2 (left pin)	24 VAC hot return from refrigerant circuit 2 Low Pressure Switch	Not effective for one stage compressor UCBs. Input is only considered after 30 seconds of C2 output; afterwards, input must be present to allow C2 output. Three LPS2 trips in a one hour period cause a “Low Pressure Switch 2 Lockout” and C2 output is then prevented until alarm reset.
	FAN OVR (right pin)	24 VAC hot out for indoor blower FAN Overload relay contact/ motor protector switch	Connects through circuit trace to the R terminal
	FAN OVR (left pin)	24 VAC hot return from indoor blower FAN Overload relay contact/motor protector switch	Input is only considered if FAN output is needed; input must be present to allow FAN output and unit operation. One FAN OVR trip lasting longer than 5 minutes or three FAN OVR trips in a two hour period cause a “Fan Overload Lockout” and unit operation is then prevented until alarm reset.

Table 49: Smart Equipment UCB - SA BUS connections

Location	Label	Description	[1]Function and comments[1]
K	PWR	Power for SA (“Sensor-Actuator”) BUS devices	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Positive of the 15 VDC (reading to C) circuit for powering an optional netstat and/or Multi Touch gateway
	C	Common for SA BUS power and communication circuits	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Negative of the SA BUS circuits
	–	Communication for SA BUS devices	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts lower than +) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection and diagnostics board, netstat and/or Multi Touch gateway
	+	Communication for SA BUS devices	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts higher than –) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection and diagnostics board, netstat and/or Multi Touch gateway
L	J8	6-pin phone jack connector	Incorporates the SA BUS terminals for convenience/alternate connection of SA BUS devices, primarily used for temporary service connection of the Multi Touch gateway

1 When wiring unit and other devices using the SA Bus and FC Bus, see .

Table 50: Smart Equipment UCB - user interface

Location	Label	Description	Function and comments
M	Display	On-board, 2-line x 8-character back-lit display	On-board display, buttons and joystick allow access to UCB, economizer, 4-stage and FDD board parameters
	ENTER	Button for display menu acknowledgment and navigation	
	CANCEL	Button for display menu navigation and zeroing of active compressor ASCD timer	
	JOY	4-way Joystick for display menu navigation	

Table 51: Smart Equipment UCB - LEDs

Location	Label	Description	Function and comments
N	POWER	Green UCB power indicator	Lit indicates 24 VAC is present at C and 24V terminals
	FAULT	Red hard lockout, networking error and firmware error indicator	1/2 second on/off flashing indicates one or more alarm is currently active, 1/10th second on/off flashing indicates a networking error (polarity, addressing) or a firmware error (likely correctable with re-loading from USB flash drive)
	SA BUS	Green UCB SA bus communication transmission indicator	Lit/flickering indicates UCB SA bus communication is currently active, off indicates the UCB is awaiting SA bus communication

Table 52: Smart Equipment UCB - optional communication sub-board

Location	Label	Description	Function and comments
O Terminal FC BUS connections	FC+	FC (“Field Connected”) BUS BACnet MSTP communication	Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to COM; at least 0.25 volts higher than –) FC bus BACnet MSTP communication circuit
	FC–	FC (“Field Connected”) BUS BACnet MSTP communication	Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to COM; at least 0.25 volts lower than +) FC bus BACnet MSTP communication circuit
	COM	Common for the FC (“Field Connected”) BUS BACnet MSTP communication circuit	Negative of the VDC FC bus BACnet MSTP communication circuit
	SHLD	Shield for the FC (“Field Connected”) BUS BACnet MSTP communication circuit	Earth ground reference of the cable to prevent interference on the FC bus BACnet MSTP communication circuit
Q	EOL switch	End Of Line selector switch for the FC BUS BACnet MSTP communication circuit	ON selected only for the UCB that is the terminus of the FC bus BACnet MSTP communication cable to prevent signal “bounce-back”
P	EOL	Green End Of Line indicator	Lit indicates the EOL switch is selected ON
	FC BUS	Green FC bus communication transmission indicator	Lit/flickering indicates outgoing UCB FC bus communication is currently active, off indicates the UCB is awaiting incoming FC bus communication
R	ISO PWR	Green communication board Isolated Power indicator	Lit indicates the UCB is supplying power to the communication sub-board

Table 53: Smart Equipment - pinned connections

Location	Label	Description	Function and comments
S	COS	Condensate Overflow Switch	COS is 24V input that senses the switch is closed if 24V is present. Binary Input – just senses 24V on/off. If COS opens, the compressor outputs are disabled. When COS is closed, compressors run normally. COS can be enabled/disabled by a menu option on the control board.
	R	R pin is 24V supply to the switch	Connects through circuit trace to the R terminal
	RDS	Refrigerant Detection System or Switch	If the switch opens, the control shuts off all outputs, except the indoor blower. Energizes the indoor blower, if it was off at the time. If the switch recloses, there will be a five minute delay, then return to normal operation. For products without an RDS, these pins must be jumpered. There are no menu options to turn this function off.
	R	R pin is 24V supply to the Sensor	Connects through circuit trace to the R terminal
T	DFS (upper pin)	24 VAC hot return from Dirty Filter Switch	Optional input; switch closure for greater than 15 seconds during indoor blower operation initiates a notification alarm
	DFS (lower pin)	24 VAC hot out for Dirty Filter Switch	Connects through circuit trace to the R terminal
	APS (upper pin)	24 VAC hot return from Air Proving Switch	When this optional input is enabled: the air proving switch must close within 30 seconds of initiation of indoor blower operation and not open for greater than 10 seconds during indoor blower operation to allow heat/cool operation and prevent an “APS open” alarm; the air proving switch must open within 30 seconds of termination of indoor blower operation to prevent an “APS stuck closed” notification alarm
	APS (lower pin)	24 VAC hot out for Air Proving Switch	Connects through circuit trace to the R terminal

Table 53: Smart Equipment - pinned connections

Location	Label	Description	Function and comments
U	AI1 +	Not used	Not used
	AI1 -	Not used	Not used
V	BO1	Not used	Not used
	BO2	Not used	Not used

Operation

Cooling sequence of operation

The factory Unit Control Board (UCB) refers to the Smart Equipment control board.

With a demand for first stage cooling either from a thermostat or space sensor, the low-voltage control circuit to "C1" and "G" is completed. For first stage cooling, the compressor is energized and the 1st stage operates. The UCB will energize the VFD equipped blower motor, multi-speed motor and outdoor fan ECM motor at low speed as set in the Smart Equipment control. When the thermostat calls for the second stage of cooling, the low-voltage control circuit to "C2" is completed. The control board energizes the 2nd stage of the compressor, multi-speed motor and outdoor fan ECM motor at high speed. If there is an initial call for both stages of cooling, the UCB will delay energizing the 2nd stage of the compressor by 30 seconds in order to avoid a power rush. Once the thermostat has been satisfied, it will de-energize C1 and C2. If the compressor has satisfied the minimum run time (3 min default), the compressors and condenser fans are de-energized. Otherwise, the unit operates until the minimum run has been completed. Upon the compressor de-energizing, the blower is stopped following the elapse of the fan off delay for cooling.

The call is passed to the Unit Control Board (UCB), which then determines whether the requested operation is available and, if so, which components to energize.

If at any time a call for both heating and cooling are present, the heating operation will be performed. If operating, the cooling system is halted as with a completion of a call for cooling. Heating always takes priority.

Continuous blower

By setting the room thermostat fan switch to "ON," the supply air blower will operate continuously.

Intermittent blower

With the room thermostat fan switch set to "AUTO" and the system switch set to either the "AUTO" or "HEAT" settings, the blower is energized whenever a cooling or heating operation is requested. The blower is energized after any specified delay associated with the operation.

When energized, the indoor blower has a minimum run time of 30 seconds. Additionally, the indoor blower has a minimum off delay of 10 seconds.

No outdoor air options

When the thermostat calls for cooling, the low-voltage control circuit from “R” to “Y1” and “G” is completed. The compressor and condenser fan motor are energized. After completing the specified fan on delay for cooling, the UCB will energize the blower motor.

Once the thermostat has been satisfied, it will de-energize Y1. If the compressor has satisfied its minimum run time, the compressor and condenser fan de-energize. Otherwise, the unit operates the cooling system until the minimum run time for the compressor has been completed. After the compressor de-energizes, the blower is stopped following the elapse of the fan off delay for cooling.

To be available on the Smart Equipment controller, a compressor must not be locked-out due to a high or low-pressure switch or freezestat trip. Additionally on the Smart Equipment controller, the Evaporator Low Limit sensor (EC1) detecting a temperature below 26°F and the anti-short cycle delay (ASCD) must have elapsed.

Economizer with dry bulb sensor for Smart Equipment

When the room thermostat calls for cooling, the low voltage control circuit from “R” to “G” and “Y1” is completed. The UCB energizes the blower motor (if the fan switch on the room thermostat is set in the “AUTO” position) and drives the economizer dampers from fully closed to their minimum position.

If the dry bulb temperature sensor for Smart Equipment reads outdoor air is below the setpoint for their respective controller, “Y1” will energize the economizer. The dampers will then modulate to maintain a constant supply air temperature as monitored by the discharge air sensor. If the outdoor air is above the dry bulb temperature setpoint for Smart Equipment, “Y1” energizes the compressor and condenser fan motor only.

Once the thermostat has been satisfied, it will de-energize “Y1”. If the compressor has satisfied its minimum run time, the compressor and condenser fan are de-energized. Otherwise, the unit operates the cooling system until the minimum run times for the compressor has been completed. After the compressor de-energizes, the blower is stopped following the elapse of the fan off delay for cooling, and the economizer damper goes to the closed position. If the unit is in continuous fan operation the economizer damper goes to the min. position.

Economizer with dual enthalpy sensors

The operation with the dual enthalpy sensors is identical to the single sensor except that a second enthalpy sensor

is mounted in the return air. This return air sensor allows the economizer to choose between outdoor air and return air, whichever has the lowest enthalpy value, to provide maximum operating efficiency.

Economizer with power exhaust

A unit equipped with an economizer (dry bulb single or dual enthalpy) and a power exhaust operates as specified above with one addition. The power exhaust motor is energized 45 seconds after the actuator position exceeds the exhaust fan set point on the economizer control. When the power exhaust is operating, the second stage of mechanical cooling will not operate. As always, the "R" to "G" connection provides minimum position but does not provide power exhaust operation.

Motorized outdoor air dampers

This system operation is the same as the units with no outdoor air options with one exception. When the “R” to “G” circuit is complete, the motorized damper drives open to a position set by the thumbwheel on the damper motor. When the “R” to “G” circuit is opened, the damper spring returns fully closed.

Cooling operation errors

Each cooling system is monitored for operation outside of the intended parameters. Errors are handled as described below. All system errors override minimum run times for compressors.

High-pressure limit switch

During cooling operation, if a high-pressure limit switch opens, the UCB will de-energize the compressor, initiate the ASCD (Anti-short cycle delay), and stop the condenser fan. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the compressor.

Should a high-pressure switch open three times within two hours of operation, the UCB will lock-out the associated compressor and send an error message to the LCD Smart Equipment Control.

Low-pressure limit switch

The low-pressure limit switch is not monitored during the initial 30 seconds of a cooling system's operation. For the following 30 seconds, the UCB will monitor the low-pressure switch to ensure it closes. If the low-pressure switch fails to close after the 30-second monitoring phase, the UCB will de-energize the compressor, initiate the ASCD, and stop the condenser fan.

Once the low-pressure switch has been proven (closed during the 30-second monitor period described above), the UCB will monitor the low-pressure limit switch for any openings. If the low-pressure switch opens for greater than 5 seconds, the UCB will de-energize the compressor, initiate the ASCD, and stop the condenser fan.

If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the compressor.

Should a low-pressure switch open three times within one hour of operation, the UCB will lock-out the compressor and send an error message to the LCD Smart Equipment Control.

Evaporator low limit (Smart Equipment Control only)

During cooling operation, if the **Evaporator Low Limit Sensor (EC1)** (Located on the Suction Line at the Evaporator Coil.) detects a temperature below 26°F (default), the UCB will de-energize the compressor, initiate the ASCD, and stop the condenser fan. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should the evaporator low limit sensor **(EC1)** detect a temperature below 26°F three times within two hours of operation, the UCB will lock-out the associated compressor and flash an error message.

Low ambient cooling (Smart Equipment Control only)

To determine when to operate in low ambient mode, the UCB has an **Outdoor Air Temperature Sensor (OAT)** with a low ambient setpoint at 45°F (default). When the **OAT Sensor** senses a temperature below the low ambient setpoint and the thermostat is calling for cooling, the UCB will operate in the low ambient mode.

Low ambient mode operates the compressors in this manner: 10 minutes on, 5 minutes off. The indoor blower is operated throughout the cycle. The 5-minute off period is necessary to defrost the indoor coil.

Low ambient mode always begins with compressor operation. Compressor minimum run time may extend the minutes of compressor operation. The off cycle will begin immediately following the elapse of the minimum run time.

When operating in low ambient mode, an **Evaporator Low Limit Sensor (EC1)** temperature below 26°F will de-energize the compressor. If the call for cooling is still present at the end of the ASCD and the evaporator temperature **(EC1)** is above 26°F, the unit will resume operation

Safety controls

The Unit Control Boards monitor the following inputs for each cooling system:

1. For Smart Equipment an evaporator low limit sensor **(EC1)** (Located on the Suction Line at the Evaporator Coil) protects against low evaporator temperatures due to a low airflow or a low return air temperature, set at 26°F.
2. A high-pressure switch to protect against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure, (opens at 625 ± 25 psig).
3. A low-pressure switch to protect against loss of refrigerant charge, (opens at 50 ± 5 psig).

The above pressure switches are hard-soldered to the unit. The refrigeration systems are independently monitored and controlled. On any fault, only the associated system is affected by any safety or preventive action.

The unit control board monitors the temperature limit switch of electric heat units and the temperature limit switch and the gas valve of gas furnace units.

Compressor protection

In addition to the external pressure switches, the compressor also has inherent (internal) protection. If there is an abnormal temperature rise in a compressor, the protector will open to shut down the compressor. The UCB incorporates features to minimize compressor wear and damage. An **Anti-Short Cycle Delay (ASCD)** is used to prevent operation of a compressor too soon after its previous run. Additionally, a minimum run time is imposed any time a compressor is energized.

The ASCD is initiated on unit start-up and on any compressor reset or lock-out.

Reheat mode sequence of operations for Smart Equipment control only

The MagnaDRY reheat mode of operation is designed to remove latent heat (humidity) from a space when there are low load conditions and the air conditioning unit is not used to cool the space. The general sequence of operation of the patented MagnaDRY reheat is outlined in the following sections. The user can select three different modes of operation from the unit control board (UCB) within the Smart Equipment controller menu. The available modes are normal, alternate, and aux. The following sections describe each mode.

Normal occupied operation mode

If the return humidity is greater than or equal to the hot gas reheat humidity set point, and there is no demand for cooling, the C1 output energizes and the AUX-HGR output energizes.

If there is a demand for one stage of cooling and the return humidity is greater than or equal to the hot gas reheat (HGR) humidity set point, the C1 output energizes but the AUX-HGR output de-energizes.

Any additional cooling demands energize compressor outputs, but do not change the status of the AUX-HGR output. When the return humidity falls to 3% or more below the set point, the C1 and AUX-HGR outputs de-energize.

Note: If HGR is enabled for unoccupied operation is enabled, during unoccupied mode the control works the same as described, except it uses the HGR unoccupied humidity set point instead.

Normal cooling mode

When there is a call for first stage cooling, with or without a call for dehumidification, the UCB de-energizes the HGR relay de-energizing SOL 2, SOL 3 (HGRH) and energizes SOL 1, engaging cooling circuit no. 1 resulting in circuit no. 1 cooling mode operation. The unit is now in first stage cooling without HGRH.

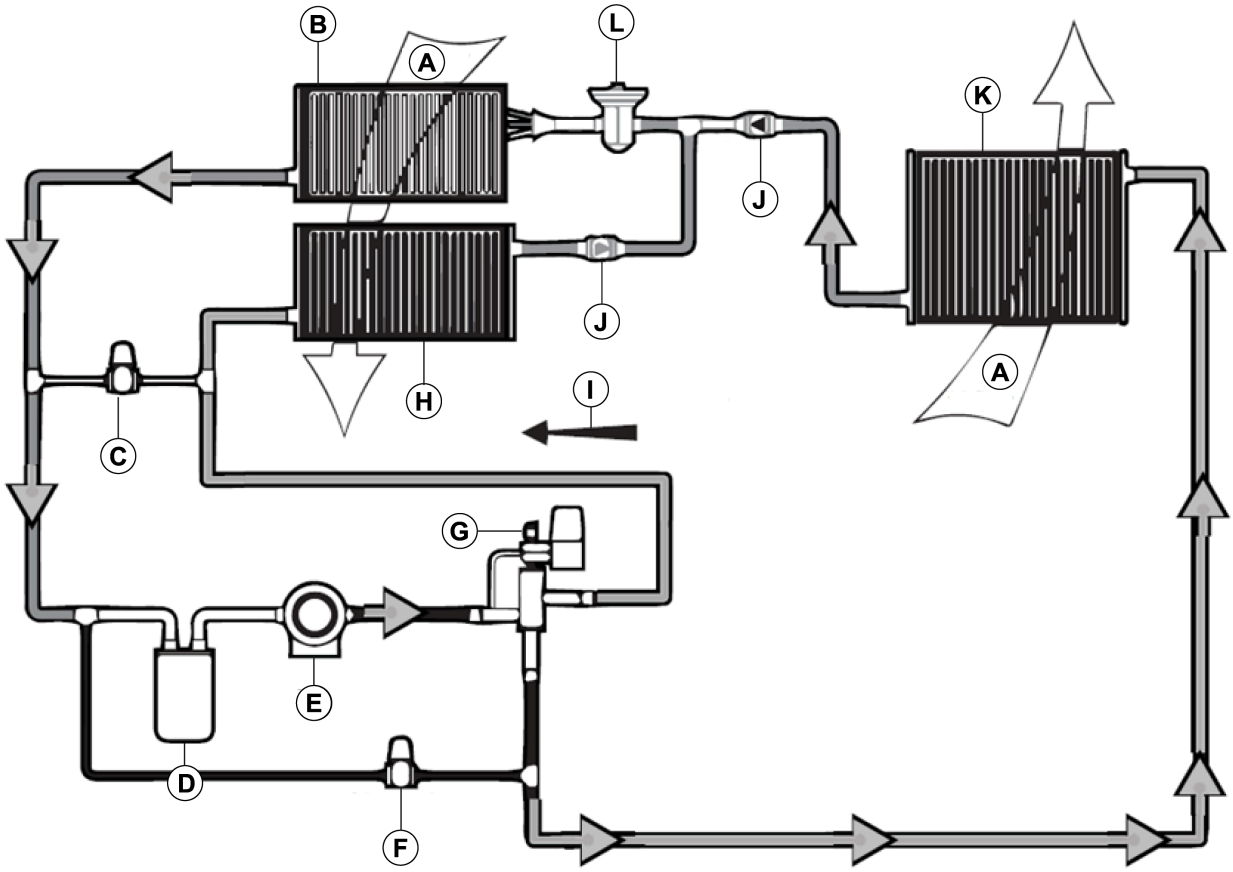
When there is a call for second stage cooling, the UCB engages both circuit no. 1 and circuit no. 2 in cooling mode. The indoor blower operation is always initiated upon a call for first stage cooling, second stage cooling or dehumidification (HGRH). The unit will not operate in the reheat mode if there is any call for heating.

On units with economizers, the unit does not operate in the reheat mode if there is a call for cooling and the economizer is operating as first stage of cooling. All safety devices function as previously described.

Normal reheat mode

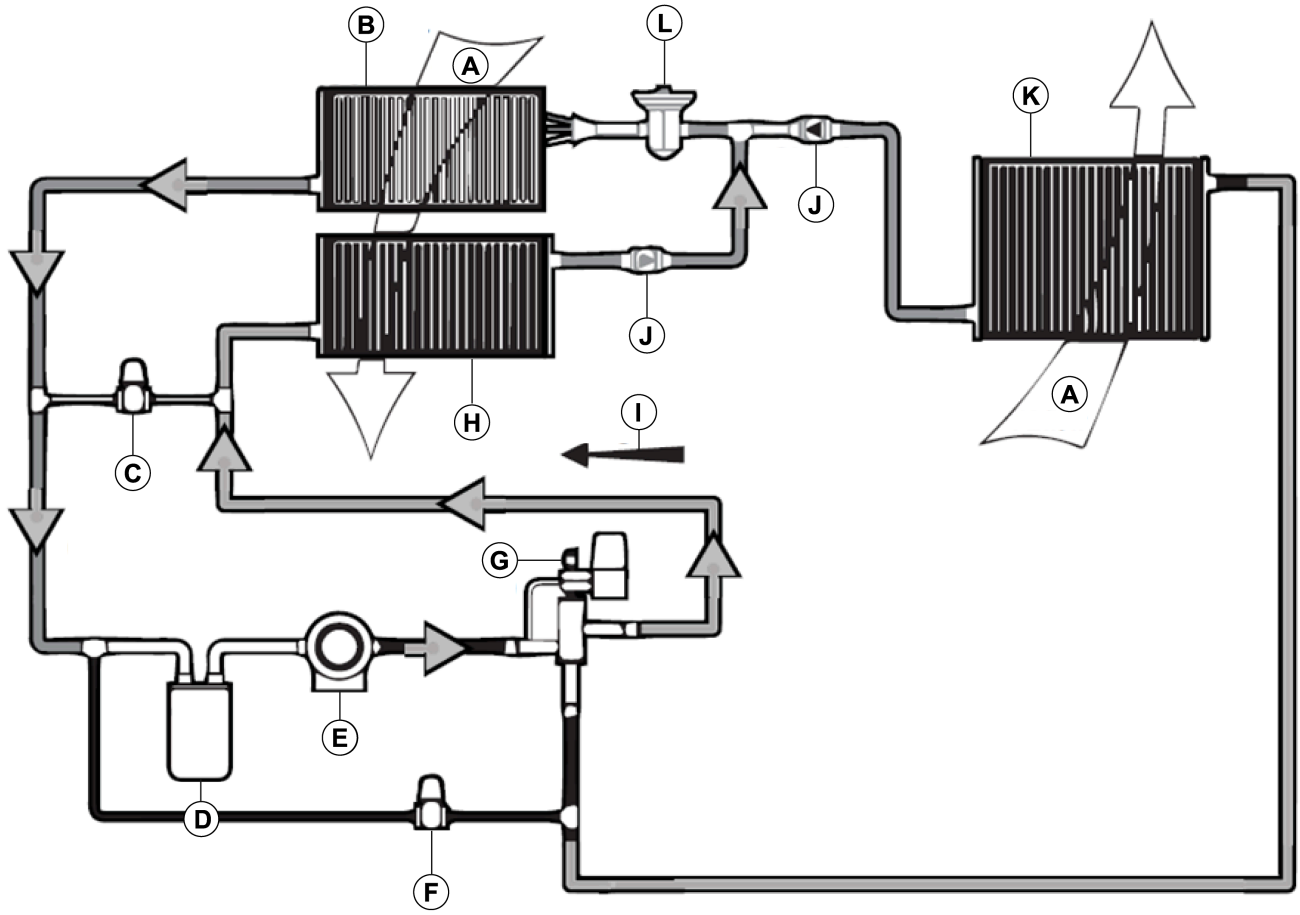
When the UCB detects a need for dehumidification through the field installed return/space humidity sensor and there is not a call for cooling, the UCB energizes solenoids SOL 3 (HGRH), SOL 2 and the reheat relay (RHR), which de-energizes SOL 1. The unit then operates with refrigerant flow in the evaporator reheat coil and condenser coil circuit no. 1. See Figure 27.

Figure 26: Cooling operation piping schematic - circuit no. 1



Callout	Component	Callout	Component
A	Airflow	G	Reheat valve (SOL 3)
B	Evaporator coil	H	Reheat coil
C	Open solenoid valve (SOL 1)	I	Refrigerant flow
D	Accumulator	J	Check valve
E	Compressor	K	Condenser coil
F	Closed solenoid valve (SOL 2)	L	TXV

Figure 27: Reheat operation piping schematic - circuit no. 1



Callout	Component	Callout	Component
A	Airflow	G	Reheat valve (SOL 3)
B	Evaporator coil	H	Reheat coil
C	Closed solenoid valve (SOL 1)	I	Refrigerant flow
D	Accumulator	J	Check valve
E	Compressor	K	Condenser coil
F	Open solenoid valve (SOL 2)	L	TXV

Alternate mode

If there is a demand for both first and second cooling stages and the return humidity is greater than or equal to the hot gas reheat humidity set point, C1 and C2 outputs energize and AUXHGR de-energizes.

Any additional cooling demands energize compressor outputs, but do not change the status of the AUX-HGR output. When the UCB detects a need for dehumidification through the field installed return/space humidity sensor and there is not a call for cooling, the UCB energizes SOL 3, SOL 2, and de-energizes SOL 1.

When there is a call for first stage cooling while there is still a call for dehumidification, no operational change is made. The call for cooling is ignored and the unit continues to operate with circuit no. 1 in reheat mode and circuit no. 2 in cooling mode.

When there is a call for second stage cooling, the UCB de-energizes the HGR, which de-energizes SOL 3 and SOL 2, and energizes SOL 1. Both circuits now operate in the cooling mode. The indoor blower operation is always initiated on a call for first stage cooling, second stage cooling or dehumidification (HGRH).

The unit does not operate in the reheat mode if there is any call for heating or two stage cooling. On units with economizers, the unit does not operate in the reheat mode if there is a call for cooling and the economizer is operating as first stage of cooling. All safety devices function as previously described.

Table 54: Dehumidification sequence in normal and alternate mode

Request	HGR	C1	C2	HGR	C1	C2
	Normal mode			Alternate mode		
Dehumidification	On	On	Off	On	On	On
One stage of cooling (Y1)	Off	On	Off	On	On	On
Two stages of cooling (Y2)	Off	On	On	Off	On	On

Optional aux mode

The aux mode available with hot gas reheat units introduces an operating mode that considers the dry bulb temperature in the space when choosing hot gas reheat staging. The aux mode reduces the amount of over cooling while maintaining humidity control in the space. The aux mode is only applicable when the unit is set up in the alternate reheat mode.

Smart Equipment economizer board details

Figure 28: SE-ECO1001-1 economizer controller

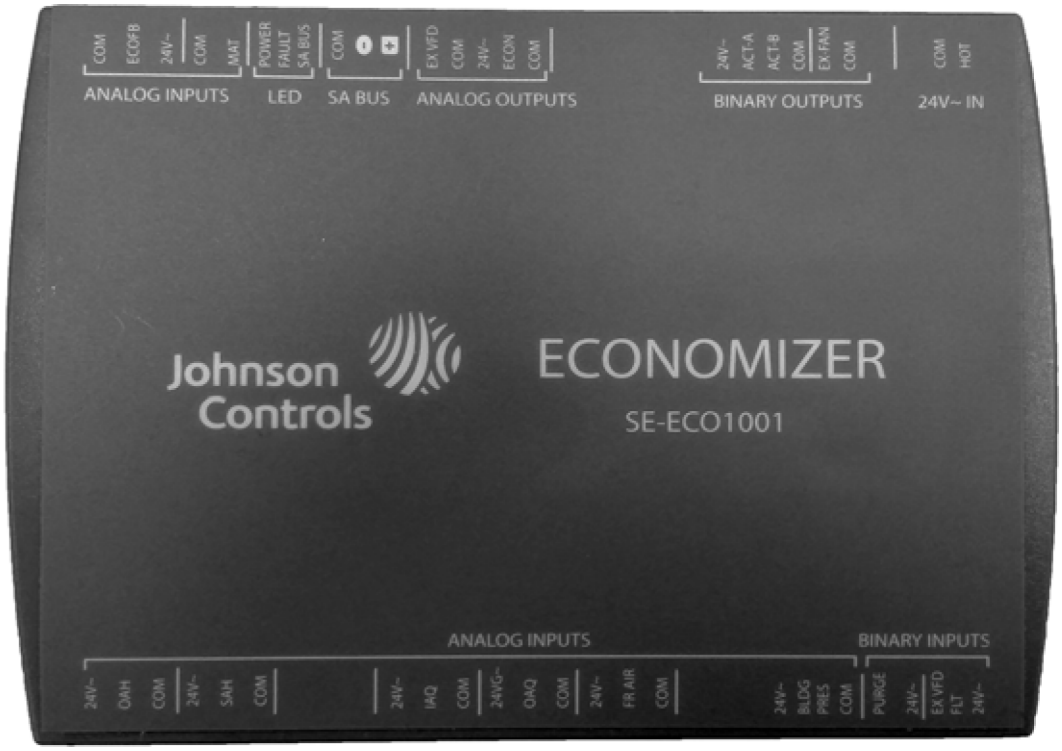


Table 55: Smart Equipment economizer board details

Board Label	Cover Label	Description	Function and comments
		Directional orientation: viewed with the center text of the cover label upright	
		ANALOG INPUTS Terminal at left on upper edge of economizer board	
C	COM	24 VAC common/0 VDC to 10 VDC negative for economizer actuator position feedback	Connects through circuit trace to 24 V~ IN pin COM
IN2	ECOFB	0 VDC to 10 VDC positive input from Economizer actuator position Feedback	EconDampPos parameter reports input status (0-100%). Used to meet Cali. Title 24 requirements for economizer actuator position feedback

If there is a call for dehumidification and no call for cooling, the unit automatically reverts back to the normal hot gas reheat mode only allowing refrigerant stage one to run in reheat mode and refrigerant stage two remains off.

If there is a call for dehumidification and a call for cooling, the unit remains in the alternate hot gas reheat mode allowing refrigerant stage one to run in hot gas reheat or dehumidification mode and refrigerant stage two runs in cooling .

Flash codes or error messages

The UCB will send an error message to the LCD Display on Smart Equipment associated with errors within the system.

Reset

Remove the call for cooling, by raising thermostat setting higher than the conditioned space temperature. This resets any pressure or freezestat lockouts.

Table 55: Smart Equipment economizer board details

Board Label	Cover Label	Description	Function and comments
R	24 V~	24 VAC hot supplied for economizer actuator position feedback	Connects through circuit trace to 24 V~ IN pin HOT
C	COM	Mixed Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	MAT parameter reports input status (°F/°C), 3.65 VDC reading MAT (+) to COM (–) with open circuit. Read-only use in current control revision.
IN1	MAT		
		LEDs at left on upper edge of economizer board	
POWER	POWER	Green UCB power indicator	Lit indicates 24 VAC is present at 24 V~ IN COM and HOT pins
FAULT	FAULT	Red networking error and firmware error indicator	1/10th second on/off flashing indicates a networking error (polarity, addressing, etc.) or a firmware error (likely correctable with re-loading from USB flash drive)
SA BUS	SA BUS	Green UCB SA bus communication transmission indicator	Lit/flickering indicates UCB-to-economizer board SA bus communication is currently active, off indicates the economizer board is awaiting SA bus communication
		[1]SA BUS[1] Pin connections at left on upper edge of economizer board	
C	COM	Common for SA BUS power and communication circuits	EconCtrlr parameter reports UCB-to-economizer board SA bus communication status. Negative of the SA BUS communication circuit to the UCB. Through the unit wiring harness, may continue on to the 4-stage board and/or fault detection & diagnostics board
–	–	Communication for SA BUS devices	EconCtrlr parameter reports UCB-to-economizer board SA BUS communication status. Positive of the VDC (typically, a fluctuating 1.5 V to 3.5 V reading to C; at least 0.25 V lower than +) SA BUS communication circuit to the UCB. Through the unit wiring harness, may continue on to the 4-stage board and/or fault detection and diagnostics board
+	+	Communication for SA BUS devices	EconCtrlr parameter reports UCB-to-economizer board SA BUS communication status. Positive of the VDC (typically, a fluctuating 1.5 V to 3.5 V reading to C; at least 0.25 V higher than –) SA BUS communication circuit to the UCB. Through the unit wiring harness, may continue on to the 4-stage board and/or fault detection and diagnostics board
		ANALOG OUTPUTS Pin at center on upper edge of economizer board	
J4	EX VFD	2 VDC to 10 VDC positive output for the modulating power Exhaust fan Variable Frequency Drive/discharge damper modulating power exhaust actuator	ExFanVFD parameter reports output status (0-100%) when ExFType selection is Variable Frequency Fan; EAD-O parameter reports output status (0-100%) when ExFType selection is Modulating Damper. Used to ramp the power exhaust fan VFD/ position the discharge damper actuator.
	COM	24 VAC common/0 VDC to 10 VDC negative for the power exhaust variable frequency drive/discharge damper modulating power exhaust actuator	Connects through circuit trace to 24 V~ IN pin COM
	24 V~	24 VAC hot supplied for the discharge damper modulating power exhaust actuator and economizer actuator	Connects through circuit trace to 24 V~ IN pin HOT
	ECON	2 VDC to 10 VDC output for the Economizer actuator	Econ parameter reports output status (0-100%). Used to position the economizer actuator for minimum position, free cooling, demand ventilation, cooling economizer loading and purge functions
	COM	24 VAC common/0 VDC to 10 VDC negative for economizer actuator	Connects through circuit trace to 24 V~ IN pin COM
		BINARY OUTPUTS Pin at right on upper edge of economizer board	
J3	24 V~	24 VAC hot supplied for an incremental (floating control) economizer actuator	Connects through circuit trace to 24 V~ IN pin HOT
	ACT-A	24 VAC hot outputs to position an incremental (floating control) economizer actuator	Unused in current control revision
	ACT-B	24 VAC return	Unused in current control revision
	COM	24 VAC common for an incremental (floating control) economizer actuator	Connects through circuit trace to 24 V~ IN pin COM
	EX-FAN	24 VAC hot output to energize power exhaust fan contactor coil/VFD enable relay coil	ExFan parameter reports output status (Off-On) when ExFType selection is Non-Modulating, Modulating Damper or Variable Frequency Fan. Used to turn on/enable the power exhaust fan motor.
	COM	24 VAC common/0 VDC to 10 VDC negative for economizer actuator	Connects through circuit trace to 24 V~ IN pin COM
		24V~ IN Pin connections at right on upper edge of economizer board	
C	COM	24 VAC transformer Common referenced to cabinet ground	24 VAC common connection to power the economizer board. Connects through circuit traces to C/COM terminals and pins distributed on the economizer board.
R	HOT	24 VAC transformer HOT	24 VAC hot connection to power the economizer board. Connects through circuit traces to R/24 V~ terminals and pins distributed on the economizer board.
		ANALOG INPUTS Terminal on lower edge of economizer board	
R	24 V~	24 VAC hot supplied for the outdoor air humidity sensor	Connects through circuit trace to 24 V~ IN pin HOT

Table 55: Smart Equipment economizer board details

Board Label	Cover Label	Description	Function and comments
IN3	OAH	0 VDC to 10 VDC positive input from the Outdoor Air Humidity sensor	OAH parameter reports input status (0-100%H). Used in outdoor air enthalpy calculation for dual enthalpy economizer free cooling changeover.
C	COM	24 VAC common/0 VDC to 10 VDC negative for the outdoor air humidity sensor	Connects through circuit trace to 24 V~ IN pin COM
R	24 V~	24 VAC hot supplied for the supply air humidity sensor	Connects through circuit trace to 24 V~ IN pin HOT
IN4	SAH	0 VDC to 10 VDC positive input from the Supply Air Humidity sensor	SAH parameter reports input status (0-100%H). Unused in current control revision.
C	COM	24 VAC common/0 VDC to 10 VDC negative for the supply air humidity sensor	Connects through circuit trace to 24 V~ IN pin COM
R	24 V~	24 VAC hot supplied for the indoor air quality sensor	Connects through circuit trace to 24 V~ IN pin HOT
IN5	IAQ	0 VDC to 10 VDC positive input from the Indoor Air Quality sensor	IAQRange parameter sets the CO2 parts per million measured by the indoor air quality sensor when it outputs 10 VDC; IAQ parameter reports input status (0-5000ppm). Used for demand ventilation functions if the NetIAQ parameter indicates ?Unrel.
C	COM	24 VAC common/0 VDC to 10 VDC negative for the indoor air quality sensor	Connects through circuit trace to 24 V~ IN pin COM
R	24 V~	24 VAC hot supplied for the outdoor air quality sensor	Connects through circuit trace to 24 V~ IN pin HOT
IN6	OAQ	0 VDC to 10 VDC positive input from the Outdoor Air Quality sensor	OAQRange parameter sets the CO2 parts per million measured by the outdoor air quality sensor when it outputs 10 VDC; OAQ parameter reports input status (0-5000ppm). Used for demand ventilation function when DVent-Mode selection is Diff between IAQ and OAQ and the NetOAQ parameter indicates ?Unrel.
C	COM	24 VAC common/0 VDC to 10 VDC negative for the outdoor air quality sensor	Connects through circuit trace to 24 V~ IN pin COM
R	24 V~	24 VAC hot supplied for the air monitoring station sensor	Connects through circuit trace to 24 V~ IN pin HOT
IN7	FR AIR	0 VDC to 10 VDC positive input from the air monitoring station sensor	MOA-Range parameter sets the cubic feet per minute/liters per second measured by the air monitoring station sensor when it outputs 10 VDC; Fr Air parameter reports input status (0-50000CFM/23595lps). Used for economizer minimum position reset in speed-controlled indoor blower applications.
C	COM	24 VAC common/0 VDC to 10 VDC negative for the air monitoring station sensor	Connects through circuit trace to 24 V~ IN pin COM
R	24 V~	24 VAC hot supplied for the building pressure sensor	Connects through circuit trace to 24 V~ IN pin HOT
IN8	BLDG PRES	0 VDC to 5 VDC positive input from the Building Pressure sensor	BldgPres parameter reports input status (-.250-.250”/w/-.062-.062kPa). Used for modulating power exhaust functions when ExFType selection is Modulating Damper or Variable Frequency Fan.
C	COM	24 VAC common/0 VDC to 5 VDC negative for the building pressure sensor	Connects through circuit trace to 24 V~ IN pin COM
		BINARY INPUTS at right on lower edge of economizer board	
IN9	PURGE	24 VAC hot input from the PURGE dry contact	Purge parameter reports input status (False with 0 VAC input-True with 24 VAC input). When Purge status is True, heating and cooling operation is prevented, the indoor blower and power exhaust fan operate, the economizer actuator is positioned to 100%.
	24 V~	24 VAC hot supplied for the purge dry contact	Connects through circuit trace to 24 V~ IN pin HOT
IN10	EX VFD FLT	24 VAC hot input from the power Exhaust Variable Frequency Drive Fault contact	ExFanVFDFlt parameter reports input status (Normal with 0 VAC input-Alarm with 24 VAC input) when ExFType selection is Variable Frequency Fan. When ExFanVFDFlt status is Alarm, EX-FAN fan output is prevented.
	24 V~	24 VAC hot supplied for the power exhaust variable frequency drive fault contact	Connects through circuit trace to 24 V~ IN pin HOT

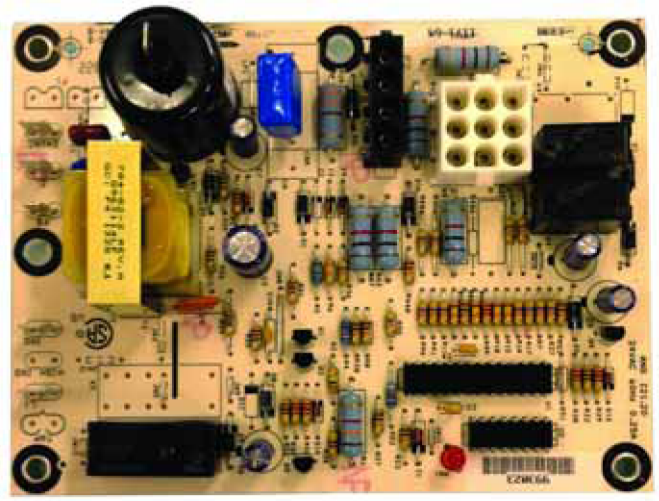
1 When wiring unit and other devices using the SA Bus and FC Bus, see Table "Cable for FC Buses and SA Buses in Order of Preference".

Indoor air quality (IAQ)

Indoor Air Quality (indoor sensor input): Terminal AQ accepts a +2 VDC to +10 VDC signal with respect to the (AQ1) terminal. When the signal is below its set point, the actuator is allowed to modulate normally in accordance with the enthalpy and mixed air sensor inputs. When the AQ signal exceeds its set point setting and there is no call for free cooling, the actuator is proportionately modulated from the 2 to 10 VDC signal, with 2 VDC corresponding to full closed and 10 VDC corresponding to full open. When there is no call for free cooling, the damper position is limited by the IAQ max damper position setting. When the signal exceeds its set point (demand control ventilation set point) setting and there is a call for free cooling, the actuator modulates from the minimum position to the full open position based on the highest call from either the mixed air sensor input or the AQ voltage input.

- Optional CO_2 Space Sensor Kit Part # 2AQ04700524B
- Optional CO_2 Sensor Kit Part # 2AQ04700624C

Figure 29: Ignition control board



Gas heating operation

1. Heating stages are controlled by the W1 through W2 thermostat inputs. A W1 or W2 input energizes a H1 or H1/H2 output.
2. When the pre-ignition process is complete the ignition module energizes the gas valve and provides a 24 V input to the MV terminal on the UCB.
3. The FAN ON HEAT DELAY timer starts as soon as 24 V is present on MV terminal. When the timer expires the FAN output for the indoor fan operation energizes. If 24 V is not received on the MV terminal within 5 minutes, an alarm appears.
4. When the thermostat heat inputs are lost **and** the 120 second minimum heat run timers have expired, heating outputs stage off. The FAN OFF HEAT DELAY timer starts when 24 V is removed from the MV terminal. When the timer expires, the FAN output for the indoor fan operation de-energizes.

   ⓘ **Note:** If 24 V is lost on the MV terminal during the same heat cycle, an alarm appears and the fan output energizes **and** remains On until 24 V is present again on the MV terminal.

   ⓘ **Note:** If 24 V is present on the MV terminal without a call for heat, an alarm appears and the fan output energizes. If this condition occurs for 6 minutes an alarm appears, and remains, until the alarm condition is cleared.

5. At any time, if 24 V is lost on the LIMIT terminal, the FAN output for indoor fan operation is energized. If 24 V is lost on the LIMIT input 3 times in 1 hour, an alarm appears and the FAN output is energized. The heating H1 and H2 outputs are de-energized until the alarm is cleared.

Gas heat ignition control board function (non Ultra-Low NOx models only)

Ignition control board on standby

The Ignition Control Board (ICB) has all outputs de-energized and monitors the thermostat and flame sense. The ICB resets ignition trial and flame loss counters. The ICB begins a call for heat when W1 is energized at the Unit Control Board (UCB). The ICB ignores W2 until ignition has been established.

Call for heat

The ICB checks to see if the pressure switch is open. If the pressure switch is closed, the ICB flashes 3 on the LED and waits indefinitely for it to open. When the pressure switch is sensed as open, the ICB begins pressure switch proving period. If the call for heat is lost, the ICB goes back to Standby.

Pressure switch proving

The ICB energizes the induced draft motor and waits for the low pressure switch to close. When the low pressure switch

closes, the control begins pre-purge period. If the call for heat is lost, the control de-energizes the inducer without post-purge and returns to standby.

If the low pressure switch does not close within 10 seconds of inducer energizing, the control flashes 2 on the LED. If the pressure switch does not close within 5 minutes of inducer energizing, the control shuts off the inducer for 30 seconds, then energizes the inducer for another 5 minute try to close the pressure switch. This cycle continues indefinitely until either the pressure switch is proved closed, or the call for heat ends.

Pre-purge

The ICB monitors the low pressure switch and ensures it remains closed during pre-purge. If the pressure switch opens, the control goes back to pressure switch proving mode. The control waits for a 15 second pre-purge period, then begins the ignition trial.

Ignition trial period

The ICB energizes the main gas valve, second stage gas valve and spark outputs for a 10 second ignition trial. The control de-energizes the spark when flame is sensed and enters a flame stabilization period.

If flame is not established within the ignition trial period, the control de-energizes the spark and gas valve and checks for maximum number of ignition trials. The ICB has a maximum number of 3 ignition trials. If the control has attempted the maximum number of ignition trials within the same call for heat without flame, the control will lockout flashing 4 on the LED. If the control has attempted less than maximum ignition trials, it begins an inter-purge period before attempting another ignition trial.

If the call for heat is lost during an ignition trial period, the control immediately de-energizes spark and gas. The control runs the inducer motor through a post purge period before de-energizing.

If the pressure switch is lost during an ignition trial period, the control immediately de-energizes spark and gas. The control begins pressure switch proving before an inter-purge and re-ignition attempt.

Flame stabilization period

If a flame is detected during the Ignition Trial Period, the ICB then enters the flame stabilization period. If a flame is not detected in 2 seconds, the main valve is de-energized and a retry operation begins. The flame stabilization period lasts 10 seconds. flame detection must be lost for 2 seconds during flame stabilization for the main valve to be de-energized. When the flame stabilization period has ended, a loss of flame detection for 3 to 4 seconds will result in the main valve being de-energized.

If flame is lost during the flame stabilization period, the control counts it as a flame loss and retries ignition or locks out as described in the Low heat section in Main burner operation.

Main burner operation

High heat warm-up

Two stage models run high heat for the first 30 seconds following flame stabilization period regardless of W2 demand. If W2 is not energized at the end of this 30 second period the control de-energizes the high gas output. If W2 is energized the control remains on high heat.

Low heat

The ICB keeps the main gas valve and induced draft motor energized while continuously monitoring the call for heat, low pressure switch, and flame status.

If the call for heat (W1) is lost, the control de-energizes the gas valve and begins post purge.

If low pressure switch opens, the control de-energizes the gas valve and begins pressure switch proving mode.

If flame is lost, the control de-energizes the gas valve within 2 second and counts the flame loss. If flame has been lost more than 5 times within the same call for heat, the control locks out flashing 5 on the LED. If flame has been lost less than 5 times, the control attempts re-ignition after a 30 second inter-purge period.

High heat

The ICB recognizes a call for 2nd stage heat when W2 is energized. The control energizes the high gas output.

If the call for 2nd stage heat goes away and the 1st stage call remains, the control de-energizes the high gas valve and returns to low heat operation.

Response to loss of W1, low pressure switch, and flame are identical to low heat operation.

Post purge

The ICB runs the induced draft motor for a 5 second post-purge period, then de-energizes the inducer. If a call for heat occurs during post-purge, the control finishes the post-purge, drops inducer out to re-prove open pressure switch before continuing with the heat cycle.

Lockout

While in lockout, the ICB keeps the main gas valve and induced draft motor de-energized.

Lockouts due to failed ignition or flame losses may be reset by removing the call for heat (W1) for more than 1 second, but less than 20 seconds, or by removing power from the control for over 0.25 seconds. The control automatically resets lockout after 60 minutes.

Lockouts due to detected internal control faults will reset after 60 minutes or power interruption.

High temperature limit switch

If the high temperature limit switch is open, the control runs the inducer, de-energize the gas valve, and flash 6 on the LED. When the high temperature switch closes, the control will restart the ignition sequence beginning with pre-purge.

If the high temperature limit is open for more than 6 minutes continuously during a call for heat, it is assumed that the main blower has failed and the control shall enter a hard lockout and flash a 9 on the LED. During the hard lockout, the control will continue to run the inducer as long as the limit switch is open. If the limit switch recloses in this hard lockout condition, the inducer will run a post purge and then shutoff. The control shall remain locked out until power is removed and shall not reset automatically.

Roll-out switch

If the roll-out switch opens for more than 0.25 seconds, the ICB will run the inducer for a post-purge period, immediately de-energize the gas valve, and flash 7 on the LED.

If the roll-out switch closes, the control shall remain locked out until power removed or W is removed. Rollout switch lockout shall not reset automatically.

Power interruptions

Power interruptions less than 0.80 seconds shall not cause the ICB to interrupt the heat sequence. Power interruptions over 0.250 seconds will cause the control reset lockout and ignition trial counters. Power interruptions of any duration shall not cause lockout or any operation requiring manual intervention.

Flame present with gas off

If flame is sensed for longer than 2 seconds during a period when the gas valve should be closed, the ICB will enter lockout. The control will turn on the inducer blower while the flame is present.

Welded gas valve relay response

If either or both Main and 2nd Stage Gas valve outputs are sensed to be off for more than 1 second when commanded to be **ON** the ICB shuts off all outputs and enters lockout.

If the Main valve output is sensed to be energized for more than 1 second when commanded to be off, the control de-energizes the induced draft motor (if flame is not present) to attempt to open the pressure switch to de-energize the gas valve. If the Main gas valve is still sensed as energized after the inducer has been off for 15 seconds, the control re-energizes the inducer to attempt to vent the unburned gas. In either case, the control locks out.

Gas heat ignition control board function (Ultra-Low NOx)

Ignition control board on standby

The ignition control board (ICB) has all outputs deenergized and monitors the thermostat and flame sense. The ICB begins a call for heat when W1 is energized at the unit control board (UCB).

Call for heat

When a thermostat call for heat is detected, the ICB first verifies that the blocked burner inlet switch, the main limit switch, and the auxiliary limit switch are all closed.

Combustion air proving

To prove proper combustion airflow, the ICB operates the inducer to verify that the pressure sensor null (zero) reading and span reading are within specifications. If the system is operating correctly, this should take only a few seconds.

Following the pressure sensor check, the draft inducer is set to the pre-purge pressure setting. Inducer pressure setpoint values are pre-programmed in the ICB in the factory. The ICB automatically increases or decreases the induced draft motor speed while monitoring the inducer pressure indicated by the pressure sensor until the correct setpoint inducer pressure value is registered. When the correct setpoint inducer pressure value is registered, the ICB begins the pre-purge period.

Pre-purge

The ICB monitors the pressure sensor and ensures that the pressure remains at the factory-programmed pre-purge inducer setpoint pressure by increasing or decreasing the induced draft motor speed. When the pre-purge period is complete, the ICB begins the ignition trial.

Ignition trial period

After the pre-purge period ends and the ignition trial begins, the ICB reduces the induced draft motor speed to operate at the factory-programmed light-off pressure and energizes spark output. The gas valve opens to supply gas to the burner after spark output is energized. The ICB de-energizes spark when the flame is sensed and the ICB enters a flame stabilization period.

When the flame is established, the ICB adjusts the induced draft motor speed to operate at the factory-programmed run pressure for the remainder of the heating cycle.

Main burner operation

The ICB keeps the main gas valve and induced draft motor energized while continuously monitoring the call for heat, pressure switch, limit switch and flame status.

If the call for heat (W) is removed, the ICB de-energizes the gas valve and begins the post-purge period and heat blower off delay.

Post purge

After a call for heat has been satisfied, the ICB runs the induced draft motor for a 30-second post-purge period. If a call for heat occurs during the post-purge period, the ICB finishes the post-purge period, and begins the next ignition sequence immediately afterward.

Ignition failures

The ICB has a built-in 60-minute soft lockout for repeated failures during the same heating call. During a lockout, the

LED on the ICB emits 1 red flash, and the ICB keeps the main gas valve and induced draft motor de-energized.

Lockouts due to repeated failures can be reset by removing the call for heat or turning off power to the ICB and turning on power to the ICB again. The ICB automatically resets after 60 minutes.

High temperature limit switches

Any time the high-temperature limit switch or auxiliary limit switch opens and has been open for less than 5 minutes, the ICB runs the indoor blower motor on heat speed, runs the inducer, and de-energizes the gas valve, and the LED on the ICB emits 4 red flashes.

If either high-temperature limit switch opens and remains open for more than 5 minutes, the ICB de-energizes the inducer and continues to operate the indoor blower motor on heat speed, and the LED on the ICB emits 10 red flashes.

Any time the high-temperature limit switch is open for more than 5 minutes, this results in a hard lockout. You must turn off the power to the unit and turn on the power to the unit again to reset the ICB.

The auxiliary limit switch is a manual-reset switch that must be reset by pressing the button on the switch.

Burner inlet pressure switch

If the combustion air entering the burner is restricted, the burner inlet pressure switch opens and safely shuts down the unit. If the burner inlet pressure switch is open, the LED on the ICB emits 6 red flashes.

Power interruptions

Power interruptions of any duration do not cause a lockout or any operation requiring manual intervention.

Flame present with gas off

If the flame is sensed during a period when the gas valve should be closed, the ICB enters a five-minute hard lockout and the LED on the ICB emits 5 red flashes. The ICB energizes the inducer blower. After five minutes, the control continues to monitor the flame sense input and resumes normal operation when flame is no longer sensed.

Gas valve fault

If the main valve output is sensed as energized when commanded to be off, the LED on the ICB emits 8 red flashes, and the ICB de-energizes the induced draft motor (if the flame is not present) to attempt to de-energize the gas valve. The ICB enters a one-hour hard lockout. After one hour, the control continues to monitor the gas valve circuit and resumes normal operation when the fault condition no longer exists.

Diagnostic fault code storage and retrieval

The ICB in the furnace has memory that stores up to five error codes to allow a service technician to diagnose problems more easily. This memory is retained even if power to the furnace is lost. If more than five error codes have occurred since the last reset, only the five most recent error codes are stored.

ⓘ **Note:** This feature must only be used by a qualified service technician.

To retrieve error codes:

1. Terminate any call for heating, cooling, or continuous fan operation. You can only retrieve error codes if there are no active thermostat signals.

2. Press the **LAST ERROR** button. The LED on the ICB flashes the error codes that are in memory, starting with the most recent. There is a 2-second pause between each error code. When the error codes have all been displayed, the LED resumes the normal slow green flash sequence after a 5-second pause.

Or

If there are no error codes in memory, the LED on the ICB emits 1 green flash.

3. To repeat the series of error codes, press the **LAST ERROR** button again

To clear the memory: Press and hold the **LAST ERROR** button for more than 5 seconds.

The LED on the ICB emits a rapid green flash when the memory is cleared, then resumes the normal slow green flash sequence after a 5-second pause.

Cooling start-up

Prestart checklist

After installation has been completed:

1. Check the electrical supply voltage being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Set the room thermostat to the off position.
3. Turn unit electrical power on.
4. Set the room thermostat fan switch to on.
5. Check indoor blower rotation.
   • If the blower rotation is in the wrong direction see . Check blower drive belt tension.
6. Check the unit supply air (CFM).
7. Measure evaporator fan motor's amp draw.
8. Set the room thermostat fan switch to off.
9. Turn unit electrical power off.
10. If using a T-Stat, set the SE control to enable T-Stat.

Operating instructions

1. Turn unit electrical power on.

   ⓘ **Note:** Before each cooling season, the crankcase heaters where equipment must be energized at least 10 hours before the system is put into operation.

2. Set the room thermostat setting to lower than the room temperature.
3. First stage compressors energize after the built-in time delay of five minutes.

Post start checklist

1. Verify correct system pressures.
2. Measure the temperature drop across the evaporator coil.

Gas heat start-up

Pre-start checklist

Complete the following checks before starting the unit.

1. Check the type of gas that is supplied. Be sure that it is the same as listed on the unit nameplate.

   Note: Note: Ultra-Low NOx (ULN) models are not approved for use with propane gas.

2. If the unit is installed at an elevation greater than 2,000 ft, confirm that the appropriate high altitude kit (if required) is installed and that the input rate is correct for the given elevation.
3. Make sure that the vent outlet and combustion air inlet are free of any debris or obstruction.

Operating instructions

CAUTION

This furnace is equipped with an automatic re-ignition system. DO NOT attempt to manually light the pilot.

Lighting the main burners

1. Turn “OFF” electric power to unit.
2. Turn room thermostat to lowest setting.
3. Turn gas valve switch to “ON” position. See Figure 31.
4. Turn “ON” electric power to unit.
5. If thermostat set temperature is above room temperature, the main burners will ignite.

Post start checklist

After the entire control circuit has been energized and the heating section is operating, make the following checks:

1. Check for gas leaks in the unit piping as well as the supply piping.

WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

2. Check for correct manifold gas pressures. See Checking gas heat input.
3. Check the supply gas pressure. It must be within the limits shown on the rating nameplate. Supply pressure should be checked with all gas appliances in the building at full fire. At no time should the standby gas pressure exceed 10.5 in. or the operating pressure drop below 4.5 in. for natural gas units. If gas pressure is outside these limits, contact the local gas utility or propane supplier for corrective action.

Shut down

1. Set the thermostat to the lowest temperature setting.
2. Turn “OFF” all electric power to unit.
3. Open gas heat access panel.
4. Turn gas valve switch to “OFF” position. See Figure 31.

Checking gas heat input

Two-stage gas heat

This unit has two stages of gas heat. First stage input is considered the minimum input for the furnace. The intended input for each furnace is shown in the Gas heat table. The table applies to units operating on 60 Hz power only.

To determine the rate of gas flow (second stage) complete the following steps:

1. Turn off all other gas appliances connected to the gas meter.
2. Turn on the furnace and make sure the thermostat is calling for second stage (100% input) heat.
3. Measure the time needed for one revolution of the hand on the lowest increment dial on the meter. A typical gas meter has a 1/2 or a 1 cubic foot test dial.

4. Using the number of seconds it takes for one revolution of the dial, calculate the cubic feet of gas consumed per hour. See the following example.
5. If necessary, adjust the high pressure regulator as discussed in the section Manifold Gas Pressure Adjustment. **Be sure not to over-fire the furnace on second stage.** If in doubt, it is better to leave the second stage of the furnace slightly under-fired. Repeat Steps 1 - 5.

To determine the rate of gas flow (first stage) complete the following steps:

1. Turn off all other gas appliances connected to the gas meter.
2. Turn on the furnace and make sure the thermostat is calling for first stage heat.
3. Even when the thermostat is calling for first stage heat, the unit will light on second stage and will run on second stage for 1 minute. Allow this one-minute time period to expire and be certain the unit is running on first stage.
4. Measure the time needed for one revolution of the hand on the lowest increment dial on the meter. A typical gas meter has a 1/2 or a 1 cubic foot test dial.
5. Using the number of seconds it takes for one revolution of the dial, calculate the cubic feet of gas consumed per hour. See the following example.
6. If necessary, adjust the low pressure regulator as discussed in the section Manifold Gas Pressure Adjustment. **Be cautious not to under-fire the furnace on first stage.** If in doubt, it is better to leave the first stage of the furnace slightly over-fired. Refer to Gas Rate Cubic Feet Per HourTable 56 for input value. Repeat Steps 1-6.

Table 56: Gas rate cubic feet per hour

Seconds for one rev.	Size of test dial	
	1/2 cu. ft.	1 cu. ft.
10	180	360
12	150	300
14	129	257
16	113	225
18	100	200
20	90	180
22	82	164
24	75	150
26	69	138
28	64	129
30	60	120
32	56	113
34	53	106
36	50	100
38	47	95
40	45	90
42	43	86
44	41	82
46	39	78

Table 56: Gas rate cubic feet per hour

Seconds for one rev.	Size of test dial	
	1/2 cu. ft.	1 cu. ft.
48	37	75
50	36	72
52	35	69
54	34	67
56	32	64
58	31	62
60	30	60

ⓘ **Note:** To find the Btu input, multiply the number of cubic feet of gas consumed per hour by the Btu content of the gas in your particular locality. Contact your local gas company for this information as it varies widely from area to area.

Example

By actual measurement, it takes 19 seconds for the hand on a 1 cubic foot dial to make a revolution with a 200,000 Btuh furnace running. To determine rotations per minute, divide 60 by 19 = 3.16. To calculate rotations per hour, multiply 3.16 • 60 = 189.6. Multiply 189.6 • 1 (0.5 if using a 1/2 cubic foot dial) = 189.6. Multiply 189.6 • (the Btu rating of the gas). For this example, assume the gas has a Btu rating of 1050 Btu/ft.^{3}. The result of 199,000 Btuh is within 2% of the 200,000 Btuh rating of the furnace.

Manifold gas pressure adjustment

Single stage

This gas furnace has one stage of gas heat. Therefore, the gas valve has one adjustment screw located under a cover screw on the valve. See Inspecting and servicing the burners and orifices (non Ultra-Low NOx models only).

Manifold pressure adjustment procedure.

1. Turn off all power to the unit.
2. Using the outlet pressure port on the gas valve, connect a manometer to monitor the manifold pressure.
3. Remove cover screw covering the pressure adjustment screw.
4. Turn on power to the unit.
5. Set thermostat to call for heat and start furnace.
6. If necessary, using a screwdriver, turn the adjustment screw clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure.
7. Once pressure has been checked, replace the plastic cap covering the pressure adjustment screw.

Two-stage

This gas furnace has two heat stages. Therefore, the gas valve has two adjustment screws located under two cover screws. The second stage adjustment screw is adjacent to the "HI" marking on the valve and the first stage adjustment

screw is located adjacent to the "LO" marking on the valve. See Direct drive.

Manifold pressure adjustment procedure.

Adjust second stage pressure first (see Table 56 for input value), then adjust first stage pressure (see Table for input value).

1. Turn off all power to the unit.
2. Using the outlet pressure port on the gas valve, connect a manometer to monitor the manifold pressure.
3. Remove cover screws covering HI and LO pressure adjustment screws.
4. Turn on power to the unit.
5. Set thermostat to call for second stage heat and start furnace.
6. If necessary, using a screwdriver, turn the second stage adjustment screw (adjacent to the “HI” marking on the valve) clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure.
7. After the high manifold pressure has been checked, adjust the thermostat to call for first stage heat.
8. If necessary, using a screwdriver, turn the first stage adjustment screw (adjacent to the “LO” marking on the valve) clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure.
9. Once pressure has been checked, replace the cover screws covering the HI and LO pressure adjustment screws.

Table 57: Gas heat stages

Model (size)	Gas heat description	Opt.	No. of burner tubes	1st stage input (Mbh)	2nd stage input (Mbh)	Total input (Mbh)
KL04 (3) single phase	Low, NOx	L	2	-	56	56
	Low	D	2	-	70	70
	Med, NOx	M	3	-	90	90
	Med	E	3	-	112	112
KL04 (3) three phase	Low, NOx	L	2	-	56	56
	Low	D	2	49	70	70
	Med, NOx	M	3	-	90	90
	Med	E	3	82	112	112
	Low, ULN	U	3	-	60	60
	High, ULN	W	5	-	100	100
KL05 (4) three phase	Low, NOx	L	2	-	56	56
	Low	D	2	49	70	70
	Med, NOx	M	3	-	90	90
	Med	E	3	82	112	112
	High, NOx	N	3	-	118	118
	High	F	3	100	145	145
	Low, ULN	U	3	-	60	60
	High, ULN	W	5	-	100	100

Table 57: Gas heat stages

Model (size)	Gas heat description	Opt.	No. of burner tubes	1st stage input (Mbh)	2nd stage input (Mbh)	Total input (Mbh)
KL06 (5) three phase	Low, NOx	L	2	-	56	56
	Low	D	2	49	70	70
	Med, NOx	M	3	-	90	90
	Med	E	3	82	112	112
	High, NOx	N	3	-	118	118
	High	F	3	100	145	145
	Low, ULN	U	3	-	60	60
	High, ULN	W	5	-	100	100

Adjustment of temperature rise

The temperature rise (the difference of temperature between the return air and the heated air from the furnace) must lie within the range shown on the unit rating plate and the data in .

After the temperature rise has been determined, the CFM can be calculated as follows:

$$\text{CFM} = \text{Btu Input} \cdot \frac{0.8}{(1.08 \cdot \Delta°\text{F})}$$

After about 20 minutes of operation, determine the furnace temperature rise. Take readings of both the return air and the heated air in the ducts (about 6 ft from the furnace) where they will not be affected by radiant heat. Increase the blower CFM to decrease the temperature rise; decrease the blower CFM to increase the rise (see).

Note: Each gas heat exchanger size has a minimum allowable CFM. Below this CFM, the limit will open.

Inspecting and servicing the burners and orifices (non Ultra-Low NOx models only)

Before checking or changing burners or orifices, **close the main manual shut-off valve and shut-off all power to the unit.**

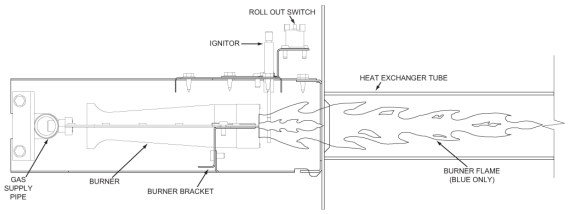
Note: Burners in ULN Ultra-Low NOx models are permanently welded into a single assembly and may not be disassembled for service.

1. Open the union fitting just upstream of the unit gas valve and downstream from the main manual shut-off valve in the gas supply line.
2. Remove the screws holding each end of the manifold to the manifold supports.
3. Disconnect wiring to the gas valve. Remove the manifold and gas valve assembly. Orifices can now be inspected or replaced.
    1. To service burners, complete Step 4.
2. Remove the heat shield on top of the manifold supports. Burners are now accessible for inspection or replacement.

    Note: Reverse the above procedure to replace the assemblies.

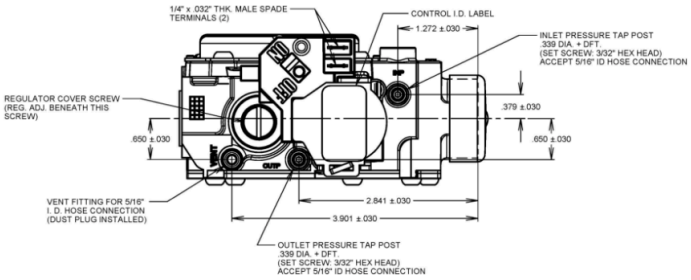
    Note: Make sure that burners are level and sit at the rear of the gas orifice.

Figure 30: Typical flame



Note: Installation of this furnace at altitudes above 2,000 ft (610 m) shall be in accordance with local codes, or in the absence of local codes, the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* or *National Standard of Canada, Natural Gas and Propane Installation Code, CSA B149.1*.

Figure 31: 3 ton through 5 ton, 1/2 in. single stage gas valve



Start up for units equipped for fan energy rating

This section applies to single phase gas heat only.

Direct drive

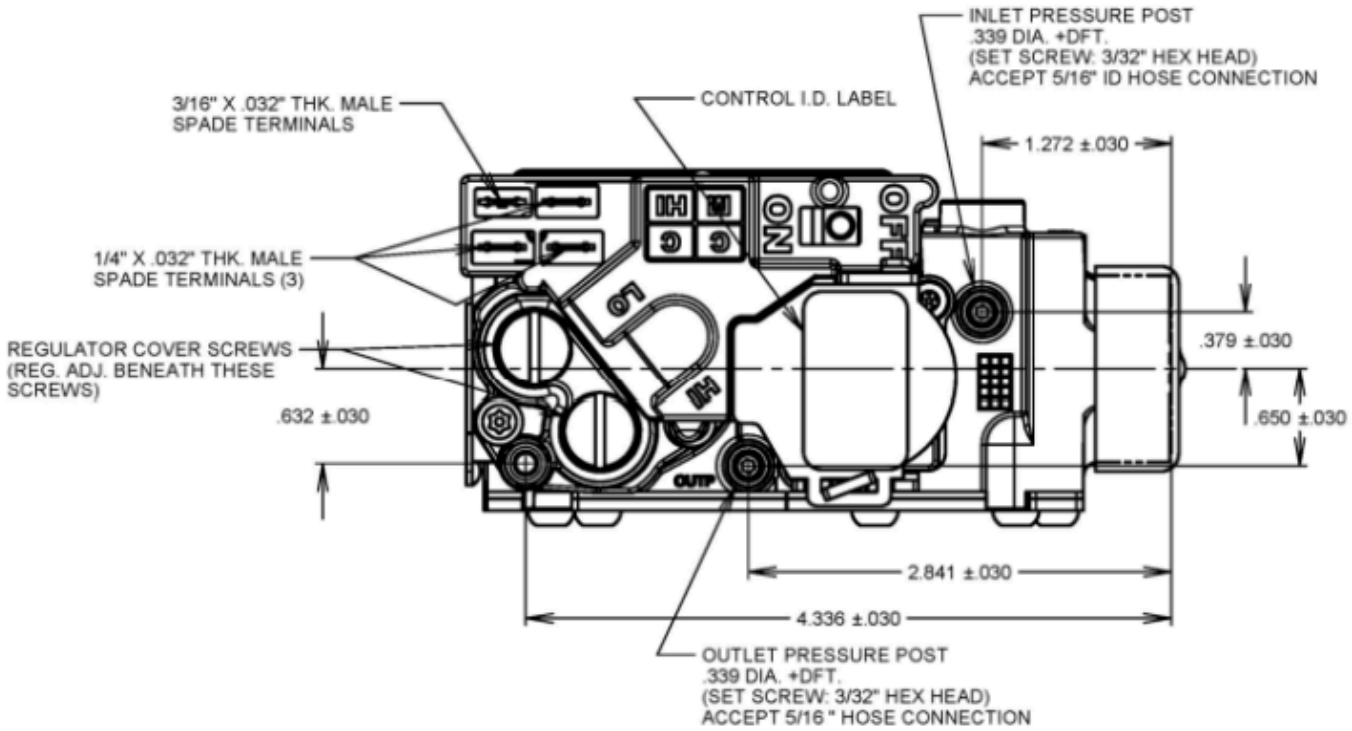
Direct drive fan energy rating (FER) units come from the factory with the following three leads that lead to the indoor motor:

- A yellow cooling lead
- A red heating lead
- A white, fan only lead

Each lead is put on a different tap on the motor and provides different speeds. The leads are set on default taps from the factory. See the wiring diagrams for details on factory default speeds. During installation, you may need to move the leads to different taps depending on the airflow and static requirements of the application.

Note: During installation, the tap chosen for the heating speed must produce a temperature rise that lies within the rise range stated on the rating plate and the physical data tables.

Figure 32: 3 ton through 5 ton, 1/2 in. two stage gas valve



Troubleshooting

WARNING

Troubleshooting of components may require opening the electrical control box with the power connected to the unit. **Use extreme care when working with live circuits!** Check the unit nameplate for the correct line voltage and set the voltmeter to the correct range before making any connections with line terminals. When not necessary, shut off all electric power to the unit prior to any of the following maintenance procedures so as to prevent personal injury.

CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation, which could cause injury to person and/or damage unit components. Verify proper operation after servicing.

⚠ WARNING

The furnace may shut down on a high temperature condition during the procedure. If this occurs, the UCB energize the supply air blower motor until the high temperature limit has reset. Caution should be used at all times as the supply air blower may energize regardless of the room thermostat fan switch position.

Table 58: Flash codes for the gas heat ignition control board (non Ultra-Low NOx models only)

Flash code	Description	Technician corrective action	Ignition control response to flash code	Method for reset
Heartbeat	*Normal Operation* - no status or error information currently needs to be displayed	None.	All functions available to respond to heating demand.	None.
Steady Off	a. *No Power to the Control* - Less than 18 VAC is present at the ignition control's R (P2-2 pin) and C (P2-1 pin) connections	Verify line voltage is present at the primary of the 75VA transformer, verify 24 VAC is present at the secondary of the 75VA transformer. Verify 24 VAC is present from the UCB's C to SD terminals indicating the 3.2A control circuit breaker and phase monitor contacts are closed. Verify 24 VAC is present at the ignition control's R (P2-2 pin) and C (P2-1 pin) connections indicating the unit to ignition control wiring is intact.	The output relay contacts open so inducer and gas valve operation is not permitted.	a. Restoration of 24 VAC power to the ignition control.
	b. The ignition control has catastrophic damage that will not allow the LED display (it is likely that there will be visible physical evidence of the damage)			b. None.
Steady On	The Ignition Control's Microprocessor Has Not Passed its Self-check	Cycle power to the control to eliminate the possibility that transient voltage conditions such as surges, brownouts, etc. have not created a false indication. If the steady on LED indication repeats, the control will need to be replaced and potential causes for failure, such as excessive voltage, RF interference, etc. should be investigated.	The output relay contacts open so inducer and gas valve operation is not permitted.	Cycling 24 VAC power to the ignition control or expiration of the 60 minute "watchdog" timer.
2 Flashes	*The Induced Draft Pressure Switch Did Not Close* - 24 VAC was not received to the ignition control's pressure switch input (P1-8 pin) within 10 seconds of the ignition control energizing the induced draft motor or 24 VAC was later lost to the control's pressure switch input while the ignition control energized the induced draft motor	Verify that the induced draft motor is operable, the ignition control's L1 to IND contacts are not open, the induced draft blower wheel is intact and there are no blockages in the combustion air / induced draft path. Verify that the induced draft pressure switch sensing tubing is intact. With an incline manometer, digital manometer or Magnehelic® gauge teed into the pressure switch sensing line verify that the negative pressure exceeds the setting listed on the induced draft pressure switch label and the switch's contacts correctly close at the setting listed	Gas valve operation is not permitted/ ends when the induced draft pressure switch input is not present. The ignition control's L1 to IND output relay contact will cycle closed for 5 minutes/open for 30 seconds until 24 VAC is received to the pressure switch input or the heating demand ends.	Closure of the pressure switch (24 VAC input to P1-8 pin), cycling first stage heat input or cycling 24 VAC power to the ignition control.
3 Flashes	*The Induced Draft Pressure Switch is Stuck Closed* - 24 VAC is received to the control's pressure switch input (P1-8 pin) at the same time as 24 VAC to initiate heating operation is received at the control's W1 input (P2-3 pin)	Verify that the induced draft pressure switch contacts are not stuck or welded closed. Verify that the ignition control's L1 to IND contacts are not stuck or welded closed causing the induced draft motor to run continuously. Verify that the wiring from the ignition control's P1-3 pin through the induced draft pressure switch to the ignition control's pressure switch input (P1-8 pin) is not shorted.	The output relay contacts open so inducer and gas valve operation is not permitted.	Opening of the pressure switch (loss of 24 VAC input to P1-8 pin) then cycling first stage heat input or cycling 24 VAC power to the ignition control.
4 Flashes	*Flame Could Not Be Established* - A flame signal of 0.2µa or greater could not be established in three consecutive attempts for ignition at the initiation of the heating cycle	Verify that the unit has proper electrical grounding. Verify the 24 VAC common and ignition control cabinet ground references are intact. Monitor the flame signal. Verify that combustion air openings are without blockages and that the unit has proper clearance to the structure and adjacent units. Verify that the burners are clean and without blockages that could interfere with gas flow. Verify that the ignitor sparks with an ≈1/8" gap to the crossover area of the left burner. Verify that the flame sensor is intact and positioned with an ≈1/8" gap to the right burner. Verify that the gas lines have been purged of air and provide proper gas inlet pressure. Verify that the gas valve is opening and adjusted to provide proper manifold pressure. Verify that the wiring to the gas valve is intact. Verify that there is no wind, rain or snow entering the heat compartment to interfere with ignition or the burners. Verify that there are no conditioned air leaks or heat exchanger breaches to interfere with ignition or the burners.	Immediately after the third ignition trial: the gas valve output relay contact opens so gas valve operation is not permitted, following a 5 second inducer post purge the induced draft output relay contact opens so inducer operation is not permitted.	Cycling first stage heat input, cycling 24 VAC power to the ignition control or expiration of the 60 minute "watchdog" timer.
5 Flashes	*Flame Loss* - After being established during ignition trials, flame signal dropped below 0.2µa five times during one heating cycle	Verify that the unit has proper electrical grounding. Verify the 24 VAC common and ignition control cabinet ground references are intact. Monitor the flame signal. Verify that combustion air openings are without blockages and that the unit has proper clearance to the structure and adjacent units. Verify that the burners are clean and without blockages that could interfere with gas flow. Verify that the flame sensor is intact and positioned with an ≈1/8" gap to the right burner. Verify that the gas lines have been purged of air and provide proper gas inlet pressure. Verify that the gas valve provides proper manifold pressure. Verify that the wiring to the gas valve is intact. Verify that there is no wind, rain or snow entering the heat compartment to interfere with ignition or the burners. Verify that there are no conditioned air leaks or heat exchanger breaches to interfere with ignition or the burners.	Immediately after the fifth flame loss: the gas valve output relay contact opens so gas valve operation is not permitted, following a 5 second inducer post purge the induced draft output relay contact opens so inducer operation is not permitted.	Cycling first stage heat input, cycling 24 VAC power to the ignition control or expiration of the 60 minute "watchdog" timer.

Table 58: Flash codes for the gas heat ignition control board (non Ultra-Low NOx models only)

Flash code	Description	Technician corrective action	Ignition control response to flash code	Method for reset
6 Flashes	*Open Limit* - 24 VAC has been lost to the control's limit switch input (P1-9 pin) or 24 VAC has been lost to the control's limit switch input (P1-9 pin) for a duration of 6 minutes or less with 24 VAC present at the control's W1 input (P2-3 pin)	Verify proper gas manifold pressure. Correct the inadequate indoor airflow condition. Verify filters, indoor coil and blower wheel are clean. Verify that the blower belt is properly maintained and adjusted; the blower motor fuses are intact, contactor and motor are operable and wheel has the correct rotation. Verify that the ducting is not restrictive. Verify indoor air volume is at least the minimum required for the heat section by using the Airflow Measurement Charts in the Technical Training Manual or other method such as temperature rise, balometer, etc. Verify heating mode blower on/off delays are proper for the heat type and provide adequate heat section cooling at the termination of the heating cycle. Verify wiring for main and auxiliary limit switches is intact.	The gas valve output relay contact opens so gas valve operation is not permitted, the induced draft output relay contact closes to operate the inducer.	Closure of the limit switch(es) (24 VAC input to P1-9 pin)
7 Flashes	*Open Rollout* - 24 VAC has been lost to the control's rollout switch input (P1-6 pin)	Verify that combustion air openings are without blockages and that the unit has proper clearance to the structure and adjacent units. Verify that the burners are clean and without blockages that could interfere with gas flow. Verify that the ignitor sparks with an ≈1/8" gap to the crossover area of the left burner. Verify that the gas lines provide proper gas inlet pressure. Verify that the gas valve is adjusted to provide proper manifold pressure. Verify that there is no wind, rain or snow entering the heat compartment to interfere with ignition or the burners. Verify that there are no conditioned air leaks or heat exchanger breaches to interfere with ignition or the burners. Verify wiring for the rollout switch is intact.	The gas valve output relay contact opens so gas valve operation is not permitted, following a 5 second inducer post purge the induced draft output relay contact opens so inducer operation is not permitted.	Closure of the rollout switch (24 VAC input to P1-6 pin) then cycling first stage heat input or cycling 24 VAC power to the ignition control.
8 Flashes	*The Gas Valve Failed To Shut Off* - flame has been sensed for longer than 2 seconds when the first stage gas valve output is off	Verify that the gas valve is not slow to shut off, leaks by or otherwise does not completely shut off gas flow when de-energized. Verify the gas valve wiring to is intact and not shorted in a manner that would improperly allow 24 VAC from another circuit to be applied to the gas valve.	The gas valve output relay contact opens so gas valve operation is not permitted, the induced draft output relay closes to operate the inducer.	Cycling 24 VAC power to the ignition control.
9 Flashes	*Indoor Airflow Failure Open Limit* - 24 VAC has been lost to the control's limit switch input (P1-9 pin) for a duration of more than 6 minutes with 24 VAC present at the control's W1 input (P2-3 pin)	Correct the no/extremely low indoor airflow condition. Verify filters, indoor coil and blower wheel are clean. Verify that the blower belt is intact, properly maintained and adjusted; the blower motor fuses are intact, contactor and motor are operable and wheel has the correct rotation. Verify that the ducting is without blockages. Verify indoor air volume is at least the minimum required for the heat section by using the Airflow Mesurement Charts in the Technical Training Manual or other method such as temperature rise, balometer, etc. Verify wiring for main and auxiliary limit switches is intact. Verify main and auxiliary limit switches are not failed in an open position.	The gas valve output relay contact opens so gas valve operation is not permitted, the induced draft output relay contact closes to operate the inducer.	Cycling 24 VAC power to the ignition control.
10 Flashes	a. *Gas Valve Miss-wire* - 24 VAC has been present for longer than 1 second at the first stage and/or second stage gas valve output (P1-7 pin and/or P1-4 pin) when the gas valve is commanded off by the ignition control b. *Ignition Control Gas Valve Relay Contact Failed to Close* - 24 VAC has not been sensed for longer than 1 second at the first stage and/or second stage gas valve output (P1-7 pin and/or P1-4 pin) when the gas valve is commanded on by the ignition control	Verify gas valve wiring from the ignition control to the gas valve is intact and not shorted in a manner that would improperly allow 24 VAC from another circuit to be applied to the control's P1-7 and/or P1-4 gas valve output pins. Verify the control's gas valve output relay contacts for first stage (P1-8 to P1-7) and second stage (P1-7 to P1-4) are not shorted or fail to close when commanded on.	Initally, the output relay contacts open. Then, if 24 VAC remains present at the P1-7 pin after 15 seconds, the induced draft output relay contact closes to operate the inducer.	Cycling 24 VAC power to the ignition control.

Table 59: Flash codes for the gas heat ignition control board (Ultra-Low NOx models only)

Flash code	Description	Technician corrective action	Ignition control response to flash code	Method for reset
Red-amber-green flash	Normal power-up of the control board (ICB)	None required - normal operation	N/A	N/A
Steady on green	Normal operation with no thermostat calls.	None required - normal operation	N/A	N/A
Rapid green flash	ICB error history has been cleared	None required - normal operation	N/A	N/A
steady on green LED	Normal operation with a call for heating operation	None required - normal operation	N/A	N/A

Table 59: Flash codes for the gas heat ignition control board (Ultra-Low NOx models only)

Flash code	Description	Technician corrective action	Ignition control response to flash code	Method for reset
Steady on red LED	Control fault is detected. Control faults include relay failures, memory failures, or other hardware failures detected during power-up self-test or during other continuous operating checks.	Turn off power to the unit and turn on power to the unit again to verify that a power surge or brownout has not caused a false error indication. If the fault code returns, replace the ICB.	No heating operation.The control locks out for a minimum of one hour and remains in lockout until the fault condition is corrected.	Replace ICB
1 red flash	System lockout due to too many failed ignition attempts.	Verify that gas supply is turned ON. Check that gas valve is turned ON. Check igniter, gas valve and flame sensor wires. Verify that the unit is properly grounded. Check the flame sense current using a microammeter. Verify that the spark igniter is clean and has a proper 1/8" spark gap.	Immediately after the third ignition retry, there is an inducer post purge and the ICB goes into a soft lockout. Unit will start a new ignition sequence every 60 minutes, if there is still a call for heat.	Cycling the call for heat or cycling power to the unit will reset the lockout and cause the unit to retry for ignition.
2 red flashes	Indicates a pressure sensor null error. The pressure sensor is sensing pressure when the draft inducer is not running and there should not be any pressure.	Check for a faulty pressure sensor or miswiring	No heating operation until the condition is corrected. The ICB enters a five minute lockout. After the lockout timer has expired, the control resumes normal operation.	Cycling the thermostat call for heat or cycling power to the unit will cause the ICB to re-start the ignition sequence
3 red flashes	Indicates a pressure sensor span error. The pressure sensor is not sensing the correct pressure.	Check for faulty inducer, broken or leaking pressure sensor hose, disconnected pressure sensor hose or wires, faulty pressure sensor, water in pressure sensor hose	No heating operation until the condition is corrected. The ICB enters a five minute lockout. After the lockout timer has expired, the control resumes normal operation.	Cycling the thermostat call for heat or cycling power to the unit will cause the ICB to re-start the ignition sequence
4 red flashes	Indicates the high-temperature limit switch is open and has been open for less than five minutes, or auxiliary limit switch is open	Check for dirty filter, incorrectly-sized duct system, duct system blockage, incorrect blower speed setting, incorrect firing rate, loose or disconnected wire from limit switch, faulty blower motor, disconnected blower motor wire. Verify that the blower wheel is rotating in the right direction.	The ICB shuts off the gas valve, runs the draft inducer and runs the indoor blower. If the high-temperature limit switch opens five times within a single call for heat, the ICB enters a 60-minute soft lockout.	Prior to lockout, closure of the limit switch circuit will cause the ICB to try for ignition. If in lockout, the call for heat or the 24 VAC power must be cycled.
5 red flashes	Indicates the flame is present with the gas valve off. The ICB has sensed a flame during a period when the gas valve is not supposed to be open.	Check for gas valve miswiring, bad gas valve not closing fully	ICB goes into lockout, opens the gas valve relay circuit and runs the draft inducer. The initial lockout time is five minutes. After five minutes, the ICB continues to monitor the flame sense and will resume normal operation when flame is no longer sensed.	Correct gas valve miswiring or gas leak-through condition. Reset hard lockout by cycling power to the unit.
6 red flashes	Indicates the burner inlet pressure switch is open.	Check for blockage in the inlet air elbow on the burner box. If no blockage is obvious in the inlet elbow, the burner assembly may be restricted internally and may need to be replaced.	The ICB opens the gas valve, runs the draft inducer and enters a five-minute lockout. If the switch is closed after five minutes have elapsed, the control resumes normal operation. The control will enter a one hour lockout state if the blocked burner switch fails to close within five minutes.	Cycling the thermostat call for heat or cycling power to the unit will cause the ICB to re-start the ignition sequence
8 red flashes	The control senses voltage present in the gas valve circuit when the gas valve should be de-energized.	Check for miswiring of the gas valve or a shorted gas valve wire. This condition can also be cause by a hardware failure on the ICB.	The ICB opens the gas valve, runs the draft inducer and enters a one-hour hard lockout. After that time, the control continues to monitor the gas valve circuit and resumes normal operation when shorted condition no longer exists.	Cycling power to the unit will cause the ICB to re-start the ignition sequence
10 red flashes	The high-temperature limit switch or auxiliary limit switch has been open for more than 5 minutes.	Check for disconnected wire from blower motor, bad blower motor, damaged blower wheel, broken blower drive belt, open manual reset auxiliary limit switch.	No heating operation is allowed. The draft inducer and main blower operate during the lockout.	This is a hard lockout condition and must be reset by cycling main power to the unit. Auxiliary limit switch located on the blower housing is a manual-reset limit. If it is open, the switch must be reset before operation can resume.

Table 59: Flash codes for the gas heat ignition control board (Ultra-Low NOx models only)

Flash code	Description	Technician corrective action	Ignition control response to flash code	Method for reset
1 amber flash	Indicates low flame current. The flame current sensed by the flame sensor has dropped below the normal level. The furnace continues to operate, but if the flame current continues to drop, the burner will shut down.	Check for a dirty or damaged flame sensor.	LED on ICB will continue to emit one amber flash code as long as the flame sense signal remains below the threshhold.	After servicing the flame sensor, turn power back on to the unit and initiate a call for heat.
2 amber flash	Indicates ID plug failure. If this error occurs, it means the ICB is unable to detect the ID plug. The ID plug is used to transmit model-specific information to the ICB. The furnace will not operate correctly without the correct ID plug installed.	Confirm that ID plug is correctly installed on ICB. Replace broken ID plug if necessary.	No heating operation is allowed until the ID plug problem is corrected and the main power is cycled.	After ID plug is connected or replaced, turn on main power and initiate a call for heat
3 amber flash	Indicates the ICB fuse is open. The low-voltage fuse on the ICB has opened or is missing.	Check for short circuits in the 24 VAC circuits. Replace fuse.	No heating operation is allowed until the fuse problem is corrected.	After overload condition is corrected and fuse has been replaced, turn on main power and initiate a call for heat
Soft lockout	A control lockout resulting from an external fault sensed by the ICB, such as successive unsuccessful ignition attempts, or a limit trip. Once in lockout, the ICB will not allow heating mode operation and will be prevented from beginning an ignition attempt in response to any call for heat for a pre-determined period of time before attempting another trial for ignition. During lockout the unit will still respond to a call for cooling.			To reset a soft lockout, remove and restart the call for heat at the thermostat.
Hard lockout	When a fault code indicating a potentially hazardous condition for users occurs, this results in a hard lockout. This includes the occurrence of repeated fault codes during a call for heat. During a hard lockout, the unit will respond to calls for cooling or fan operation, but ignores calls for heat.			To reset a hard lockout, you must cycle high-voltage power to the ICB.

Charging tables

Table 60: KL04 charging table

Air flow indoor Db/Wb	Outdoor DB	Suction P	Suction temp.	Liquid P	Liquid temp.	Delta T Db	Compr. amps
300 Cfm/Ton 80/62	75	132	60	260	81	-25	8.2
	85	130	59	304	89	-26	9.3
	95	127	57	347	98	-27	10.4
300 Cfm/Ton 80/67	75	131	59	261	81	-25	8.2
	85	133	60	305	89	-24	9.4
	95	136	60	350	97	-23	10.5
300 Cfm/Ton 80/72	75	130	58	262	81	-25	8.2
	85	137	61	307	89	-22	9.4
	95	144	63	352	97	-19	10.6
300 Cfm/Ton 75/62	75	126	57	260	79	-23	8.2
	85	126	57	304	88	-22	9.3
	95	126	57	348	96	-22	10.5
400 Cfm/Ton 80/62	75	136	62	263	81	-23	8.3
	85	136	62	307	90	-23	9.4
	95	137	61	352	99	-23	10.6
400 Cfm/Ton 80/67	75	137	62	264	81	-22	8.3
	85	139	62	309	89	-21	9.4
	95	141	62	354	98	-21	10.6
400 Cfm/Ton 80/72	75	138	62	265	81	-22	8.3
	85	142	62	311	89	-20	9.4
	95	145	63	357	96	-18	10.6
400 Cfm/Ton 75/62	75	130	60	263	79	-20	8.3
	85	131	59	308	88	-20	9.4
	95	133	59	353	97	-19	10.6

Table 61: KL05 charging table

Air flow indoor Db/Wb	Outdoor DB	Suction P	Suction temp.	Liquid P	Liquid temp.	Delta T Db	Compr. amps
300 Cfm/Ton 80/62	75	136	64	317	93	-25	12.7
	85	133	63	337	97	-26	13.4
	95	130	63	358	101	-27	14.0
300 Cfm/Ton 80/67	75	133	62	272	85	-26	11.3
	85	135	64	317	93	-25	12.7
	95	137	66	362	100	-23	14.2
300 Cfm/Ton 80/72	75	130	61	228	77	-27	9.8
	85	137	65	297	88	-23	12.1
	95	144	70	367	99	-19	14.4
300 Cfm/Ton 75/62	75	129	61	292	87	-23	11.9
	85	128	61	325	93	-23	12.9
	95	128	62	358	99	-23	14.0
400 Cfm/Ton 80/62	75	139	66	294	89	-23	12.0
	85	139	66	327	95	-23	13.1
	95	139	66	360	102	-23	14.1
400 Cfm/Ton 80/67	75	139	65	273	86	-23	11.3
	85	141	66	318	93	-22	12.8
	95	143	67	363	101	-21	14.2
400 Cfm/Ton 80/72	75	139	64	252	83	-23	10.7
	85	143	66	309	92	-21	12.5
	95	146	68	365	101	-19	14.3
400 Cfm/Ton 75/62	75	133	63	281	85	-21	11.5
	85	134	64	320	93	-20	12.8
	95	135	65	360	100	-20	14.1

Table 62: KL06 charging table

Air flow indoor Db/Wb	Outdoor DB	Suction P	Suction temp.	Liquid P	Liquid temp.	Delta T Db	Compr. amps
300 Cfm/Ton 80/62	75	134	64	271	83	-25	13.8
	85	132	62	314	92	-26	15.5
	95	131	59	357	101	-27	17.2
300 Cfm/Ton 80/67	75	133	63	270	83	-25	13.7
	85	136	61	315	92	-24	15.6
	95	139	60	360	102	-23	17.4
300 Cfm/Ton 80/72	75	132	61	269	83	-26	13.6
	85	139	60	316	93	-23	15.6
	95	147	60	364	102	-19	17.6
300 Cfm/Ton 75/62	75	127	61	271	82	-23	13.7
	85	128	60	314	91	-23	15.4
	95	128	59	357	100	-22	17.2
400 Cfm/Ton 80/62	75	140	67	273	84	-23	13.9
	85	140	64	317	93	-23	15.7
	95	141	62	362	102	-22	17.5
400 Cfm/Ton 80/67	75	140	65	273	84	-22	13.9
	85	142	64	319	93	-21	15.8
	95	145	64	365	103	-20	17.6
400 Cfm/Ton 80/72	75	140	63	274	84	-22	13.9
	85	144	64	321	93	-20	15.8
	95	148	66	368	103	-18	17.7
400 Cfm/Ton 75/62	75	133	64	272	83	-20	13.8
	85	135	62	317	92	-20	15.7
	95	136	60	362	102	-19	17.5

Smart Equipment Control Board Navigation components

You need the following components to access the control points in the Smart Equipment control.

Note: Installation and operation guides are available from your equipment dealer or distributor.

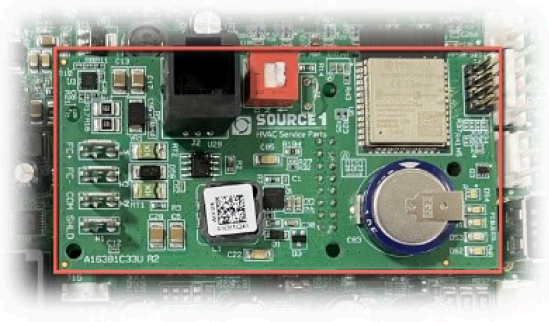
1. A local LCD on the unit control board.
2. Tools to interact with the UCB.
   Choose from the following two options:
   a. • GoTemp Pro app (available for iOS or Android)

Note: You can connect the GoTemp Pro app to the controller via Bluetooth through the Connected Workflow Converter (CWCVT) or directly to the UCB if the controller has a communication card.

- *CWCVT Wireless MS/TP Converter User Guide*, literature part no. 12014120

Figure 33: CWCVT (S1-TL-CWCVT-0)

Figure 34: Communication card



A0210-A-0324

b. Mobile Access Portal (MAP) Gateway (portable)

- Source 1 part no. S1-YK-MAP1810-0P (no longer available for purchase - We strongly recommend that the GoTemp Pro app be used for all R-454B units for best user experience.)

  Note: Although the MAP is no longer available for purchase, it continues to work with the UCB. The MAP does not receive firmware updates, so as additional points are added to the UCB those points will not render properly. However, the MAP will continue to work for the majority of typical applications.

- *MAP Gateway Quick Start Guide*, part no. 24-10737-16
- *MAP Gateway Instruction*, part no. 24-10737-8

For more information on the Smart Equipment unit control board navigation, refer to the *Smart Equipment Quick Start Guide*.

Note: For more in-depth sequence of operation of the Smart Equipment control, refer to the *Smart Equipment Controls Sequence of Operation Overview*, literature part no. 12011950.

Start-up & Service Data Instruction

Commercial Package Units

3.0 To 50.0 tons

Start-up Checklist

Date: _____

Job Name: _____

Customer Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Model Number: _____ Serial Number: _____

Qualified Start-up Technician: _____ Signature: _____

HVAC Contractor: _____ Phone: _____

Address: _____

Contractor's E-mail Address: _____

Electrical Contractor: _____ Phone: _____

Distributor Name: _____ Phone: _____

Warranty Statement

BHC Residential & Light Commercial LLC is confident that this equipment will operate to the owner's satisfaction if the proper procedures are followed and checks are made at initial start-up. This confidence is supported by the 30 day dealer protection coverage portion of our standard warranty policy which states that BHC Residential & Light Commercial LLC will cover parts and labor on new equipment start-up failures that are caused by a defect in factory workmanship or material, for a period of 30 days from installation. Refer to the current standard warranty policy and warranty manual for details.

In the event that communication with BHC Residential & Light Commercial LLC is required regarding technical and/or warranty concerns, all parties to the discussion should have a copy of the equipment start-up sheet for reference. A copy of the original start-up sheet should be filed with the Technical Services Department.

The packaged unit is available in constant or variable air volume versions with a large variety of custom options and accessories available. Therefore, some variation in the startup procedure will exist depending upon the products capacity, control system, options and accessories installed.

This start-up sheet covers all startup check points common to all package equipment. In addition it covers essential startup check points for a number of common installation options. Depending upon the particular unit being started not all sections of this startup sheet will apply. Complete those sections applicable and use the notes section to record any additional information pertinent to your particular installation.

Warranty claims are to be made through the distributor from whom the equipment was purchased.

Equipment Startup

Use the local LCD or GoTemp Pro mobile application to complete the start-up.

A copy of the completed start-up sheet should be kept on file by the distributor providing the equipment and a copy sent to:

BHC Residential & Light Commercial LLC
Technical Services Department
5005 York Drive
Norman, OK 73069

1034349-UCL-L-0426

Safety Warnings

The inspections and recording of data outlined in this procedure are required for start-up of BHC Residential & Light Commercial LLC' packaged products. Industry recognized safety standards and practices must be observed at all times. General industry knowledge and experience are required to assure technician safety. It is the responsibility of the technician to assess all potential dangers and take all steps warranted to perform the work in a safe manner. By addressing those potential dangers, prior to beginning any work, the technician can perform the work in a safe manner with minimal risk of injury.

⚠WARNING

Lethal voltages are present during some start-up checks. Extreme caution must be used at all times.

⚠WARNING

Moving parts may be exposed during some startup checks. Extreme caution must be used at all times.

NOTE: Read and review this entire document before beginning any of the startup procedures.

Design Application Information

This information will be available from the specifying engineer who selected the equipment. If the system is a VAV system the CFM will be the airflow when the remote VAV boxes are in the full open position and the frequency drive is operating at 60 HZ. **Do not proceed with the equipment start-up without the design CFM information.**

Design Supply Air CFM: _____ Design Return Air CFM:_____

Design Outdoor Air CFM At Minimum Position: _____

Total External Static Pressure: _____

Supply Static Pressure: _____

Return Static Pressure: _____

Design Building Static Pressure: _____

Outside Air Dilution: Economizer Position Percentage: _____ CFM: _____

Supply Gas Pressure After Regulator W/o Heat Active _____ Inches_____

ADDITIONAL APPLICATION NOTES FROM SPECIFYING ENGINEER:

Reference

General Inspection	Completed	See Notes
Unit inspected for shipping, storage, or rigging damage	☐	☐
Unit installed with proper clearances	☐	☐
Unit installed within slope limitations	☐	☐
Refrigeration system checked for gross leaks (presence of oil)	☐	☐
Terminal screws and wiring connections checked for tightness	☐	☐
Filters installed correctly and clean	☐	☐
Economizer hoods installed in operating position	☐	☐
Condensate drain trapped properly, refer to Installation Manual	☐	☐
Economizer damper linkage tight	☐	☐
Gas Heat vent hood installed	☐	☐
All field wiring (power and control) complete	☐	☐

Air Moving Inspection	Completed	See Notes
Alignment of drive components	☐	☐
Belt tension adjusted properly	☐	☐
Blower pulleys tight on shaft, bearing set screws tight, wheel tight to shaft	☐	☐
Pressure switch or transducer tubing installed properly	☐	☐

Exhaust Inspection Powered ☐ Barometric Relief ☐	Completed	See Notes
Check hub for tightness	☐	☐
Check fan blade for clearance	☐	☐
Check for proper rotation	☐	☐
Check for proper mounting (screen faces towards unit)	☐	☐
Prove operation by increasing minimum setting on economizer	☐	☐

Economizer Inspection Standard ☐ BAS ☐	Completed	See Notes
CO_2 sensor installed Yes ☐ No ☐	☐	☐
Check economizer setting (Reference Smart Equipment Control Board LCD menu location)	☐	☐
Prove economizer open/close through Smart Equipment Board Setting	☐	☐

Reheat Mode Normal ☐ or Alternate ☐ Not Applicable ☐
Humidity Sensor (2SH0401) _____

Operating Measurements - Air Flow

Fan operates with proper rotation (All VFD equipped units with the optional Manual Bypass must be phased for correct blower rotation with the Bypass switch set in the LINE position) ID Fans ☐ Exh. Fans ☐ Cond. Fans ☐	
Pressure drop across dry evaporator coil (At maximum design CFM) [1]	IWC
External Static Pressure	IWC
Return Static Pressure	IWC
Supply Static Pressure	IWC
Supply Air CFM Using Dry Coil Chart	CFM
Final Adjusted Supply Air CFM[2]	CFM

1. Consult the proper airflow to pressure drop table to obtain the actual airflow at the measured pressure differential.
2. Was a motor pulley adjustment or change required to obtain the correct airflow?
   Was it necessary to increase of decrease the airflow to meet the design conditions?
   If the motor pulley size was changed, measure the outside diameters of the motor and blower pulleys and record those diameters here;

Blower Motor HP _____ FLA_____ RPM_____

Pulley Pitch Diameter _____Turns Out_____ Final Turns Out_____

Blower Pulley Pitch Diameter _____ Fixed Sheave_____

Electrical Data

T1 - T2 _____ Volts T2 - T3 _____ Volts

Control Voltage _____ Volts T1 - T3 _____ Volts

Device	Nameplate	Measured List All Three Amperages
Supply Fan Motor[1, 2]	AMPS	AMPS
Exhaust Motor (Dampers 100%)	AMPS	AMPS
Condenser Fan #1	AMPS	AMPS
Condenser Fan #2 (if equipped)	AMPS	AMPS
Condenser Fan #3 (if equipped)	AMPS	AMPS
Condenser Fan #4 (if equipped)	AMPS	AMPS
Compressor #1	AMPS	AMPS
Compressor #2 (if equipped)	AMPS	AMPS
Compressor #3 (if equipped)	AMPS	AMPS
Compressor #4 (if equipped)	AMPS	AMPS

1. VAV units with heat section - simulate heat call to drive VAV boxes and VFD/IGV to maximum design airflow position.
2. VAV units without heat section - VAV boxes must be set to maximum design airflow position.

Refrigerant Safeties

Action	Completed	See Notes
Prove Compressor Rotation (3 phase only) by gauge pressure	☐	☐
Prove High Pressure Safety, All Systems	☐	☐
Prove Low Pressure Safety, All Systems	☐	☐

Refrigerant Detection System (RDS) Safety Test

Action	Completed	See Notes
Does the System have a Refrigerant Detection System (RDS) installed for R-454B?	☐	☐
Does Control Board Show any RDS alarms?	☐	☐
Are all available RDS Sensors pulsing with a green light?	☐	☐
Caution do not continue until any RDS alarms are resolved		
Prove Refrigerant Detection System Alarm Mitigation (Heating Units) – Shuts Down Active Heat Call[1]	☐	☐
Prove Refrigerant Detection System Alarm Mitigation (Cooling Mode) – Shuts Down Active Cooling Call[1]	☐	☐

1. Complete the above steps by pulling the J1 harness off the UCB during an active call for heat/cooling

Operating Measurements - Cooling

Stage	Discharge Pressure	Discharge Temp.	Liquid Line Temp.[1]	Subcooling[2]	Suction Pressure	Suction Temp.	Superheat
First	#	°	°	°	#	°	°
Second (if equipped)	#	°	°	°	#	°	°
Third (if equipped)	#	°	°	°	#	°	°
Fourth (if equipped)	#	°	°	°	#	°	°
Reheat 1st Stage	#	°	°	°	#	°	°

1. Liquid temperature should be taken before filter/drier.
2. Subtract 10 psi from discharge pressure for estimated liquid line pressure

Outside air temperature	_____	°F db	_____	°F wb	_____ %RH
Return Air Temperature	_____	°F db	_____	°F wb	_____ %RH
Mixed Air Temperature	_____	°F db	_____	°F wb	_____ %RH
Supply Air Temperature	_____	°F db	_____	°F wb	_____ %RH

Operating Measurements - Gas Heating

Fuel Type: ☐ Natural Gas ☐ LP Gas

Action		Completed	See Notes
Check for gas leaks		☐	☐
Prove Ventor Motor Operation		☐	☐
Prove Primary Safety Operation		☐	☐
Prove Auxiliary Safety Operation		☐	☐
Prove Rollout Switch Operation		☐	☐
Prove Smoke Detector Operation		☐	☐
Manifold Pressure	Stage 1	IWC	☐
	Stage 2 (If Equipped)	IWC	☐
	Stage 3 (If Equipped)	IWC	☐
Supply gas pressure at full fire		IWC	☐
Check temperature rise[1]	☐ measured at full fire	°F	☐

1. Input X Eff. (BTU output)
   1.08 X Temp. Rise

Operating Measurements Electric Heating

Heater kW _____kW Heater Voltage, Nameplate _____ Volts

Heater Model Number: _____

Serial Number: _____

Heater	Nameplate	Measured List All Three Amperages		
Stage 1	_____AMPS	_____AMPS	_____AMPS	_____AMPS
Stage 2	_____AMPS	_____AMPS	_____AMPS	_____AMPS
Stage 3	_____AMPS	_____AMPS	_____AMPS	_____AMPS
Stage 4	_____AMPS	_____AMPS	_____AMPS	_____AMPS
Checked Heater Limit			Yes ☐	No ☐
Air Moving Switch Installed?			Yes ☐	No ☐

Operating Measurements - Staging Controls

Verify Proper Operation of Heating/Cooling Staging Controls	
Create a cooling demand at the Thermostat, BAS System or Smart Equipment Verify that cooling/economizer stages are energized.	☐
Create a heating demand at the Thermostat, BAS System or Smart Equipment Verify that heating stages are energized.	☐
Verify Proper Operation of the Variable Frequency Drive (If Required)	
Verify that motor speed modulates with duct pressure change.	☐

Final - Inspection

Verify that all operational control set points have been set to desired value Scroll through all setpoints and change as may be necessary to suit the occupant requirements.	☐
Verify that all option parameters are correct Scroll through all option parameters and ensure that all installed options are enabled in the software and all others are disabled in the software. (Factory software settings should match the installed options)	☐
Verify that all access panels have been closed and secured	☐
Save a backup file from the unit control board onto a USB flash drive.	☐

Observed Product Deficiencies & Concerns:

1034349-UCL-L-0426
Supersedes: 1034349-UCL-K-0126

BHC Residential & Light Commercial LLC
5005 York Drive
Norman, OK 73069